

Fishery Management Report No. 00-11

Fishery Management Report for Sport Fisheries in the Northwest Alaska Management Area, 1998

by

Fred DeCicco

November 2000

Alaska Department of Fish and Game

Division of Sport Fish



Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used in Division of Sport Fish Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications without definition. All others must be defined in the text at first mention, as well as in the titles or footnotes of tables and in figures or figure captions.

Weights and measures (metric)		General		Mathematics, statistics, fisheries	
centimeter	cm	All commonly accepted abbreviations.	e.g., Mr., Mrs., a.m., p.m., etc.	alternate hypothesis	H _A
deciliter	dL	All commonly accepted professional titles.	e.g., Dr., Ph.D., R.N., etc.	base of natural logarithm	e
gram	g	and	&	catch per unit effort	CPUE
hectare	ha	at	@	coefficient of variation	CV
kilogram	kg	Compass directions:		common test statistics	F, t, χ^2 , etc.
kilometer	km	east	E	confidence interval	C.I.
liter	L	north	N	correlation coefficient	R (multiple)
meter	m	south	S	correlation coefficient	r (simple)
metric ton	mt	west	W	covariance	cov
milliliter	ml	Copyright	©	degree (angular or temperature)	°
millimeter	mm	Corporate suffixes:		degrees of freedom	df
Weights and measures (English)		Company	Co.	divided by	÷ or / (in equations)
cubic feet per second	ft ³ /s	Corporation	Corp.	equals	=
foot	ft	Incorporated	Inc.	expected value	E
gallon	gal	Limited	Ltd.	fork length	FL
inch	in	et alii (and other people)	et al.	greater than	>
mile	mi	et cetera (and so forth)	etc.	greater than or equal to	≥
ounce	oz	exempli gratia (for example)	e.g.,	harvest per unit effort	HPUE
pound	lb	id est (that is)	i.e.,	less than	<
quart	qt	latitude or longitude	lat. or long.	less than or equal to	≤
yard	yd	monetary symbols (U.S.)	\$, ¢	logarithm (natural)	ln
Spell out acre and ton.		months (tables and figures): first three letters	Jan,...,Dec	logarithm (base 10)	log
Time and temperature		number (before a number)	# (e.g., #10)	logarithm (specify base)	log ₂ , etc.
day	d	pounds (after a number)	# (e.g., 10#)	mideye-to-fork	MEF
degrees Celsius	°C	registered trademark	®	minute (angular)	'
degrees Fahrenheit	°F	trademark	™	multiplied by	x
hour (spell out for 24-hour clock)	h	United States (adjective)	U.S.	not significant	NS
minute	min	United States of America (noun)	USA	null hypothesis	H ₀
second	s	U.S. state and District of Columbia abbreviations	use two-letter abbreviations (e.g., AK, DC)	percent	%
Spell out year, month, and week.				probability	P
Physics and chemistry				probability of a type I error (rejection of the null hypothesis when true)	α
all atomic symbols				probability of a type II error (acceptance of the null hypothesis when false)	β
alternating current	AC			second (angular)	"
ampere	A			standard deviation	SD
calorie	cal			standard error	SE
direct current	DC			standard length	SL
hertz	Hz			total length	TL
horsepower	hp			variance	Var
hydrogen ion activity	pH				
parts per million	ppm				
parts per thousand	ppt, ‰				
volts	V				
watts	W				

FISHERY MANAGEMENT REPORT NO. 00-11

**FISHERY MANAGEMENT REPORT FOR SPORT FISHERIES IN THE
NORTHWEST ALASKA MANAGEMENT AREA, 1998**

by

Fred DeCicco,
Division of Sport Fish, Fairbanks

Alaska Department of Fish and Game
Division of Sport Fish, Research and Technical Services
333 Raspberry Road, Anchorage, Alaska, 99518-1599

November 2000

The Fishery Management Reports series was established in 1989 for the publication of an overview of Division of Sport Fish management activities and goals in a specific geographic area. Fishery Management Reports are intended for fishery and other technical professionals, as well as lay persons. Fishery Management Reports are available through the Alaska State Library and on the Internet: <http://www.sf.adfg.state.ak.us/statewide/divreports/html/intersearch.cfm> This publication has undergone regional peer review.

Fred DeCicco

*Alaska Department of Fish and Game, Division of Sport Fish, Region III,
1300 College Road, Fairbanks, AK 99701-1599, USA*

This document should be cited as:

DeCicco, F. 2000. Fishery Management Report for sport fisheries in the Northwest Alaska regulatory areas, 1998. Alaska Department of Fish and Game, Fishery Management Series No. 00-11, Anchorage.

The Alaska Department of Fish and Game administers all programs and activities free from discrimination on the bases of race, color, national origin, age, sex, religion, marital status, pregnancy, parenthood, or disability. The department administers all programs and activities in compliance with Title VI of the Civil Rights Act of 1964, Section 504 of the Rehabilitation Act of 1973, Title II of the Americans with Disabilities Act of 1990, the Age Discrimination Act of 1975, and Title IX of the Education Amendments of 1972.

If you believe you have been discriminated against in any program, activity, or facility, or if you desire further information please write to ADF&G, P.O. Box 25526, Juneau, AK 99802-5526; U.S. Fish and Wildlife Service, 4040 N. Fairfield Drive, Suite 300, Arlington, VA 22203 or O.E.O., U.S. Department of the Interior, Washington DC 20240.

For information on alternative formats for this and other department publications, please contact the department ADA Coordinator at (voice) 907-465-4120, (TDD) 907-465-3646, or (FAX) 907-465-2440.

TABLE OF CONTENTS

	Page
LIST OF TABLES.....	v
LIST OF FIGURES.....	v
LIST OF APPENDICES	vi
PREFACE.....	1
INTRODUCTION	2
Region III Description	2
The Alaska Board of Fisheries	4
Advisory Committees	4
ADF&G Emergency Order Authority	4
Region III Sport Fish Division Research and Management Staffing.....	4
The Statewide Harvest Survey.....	5
SECTION I: NORTHWESTERN MANAGEMENT AREA OVERVIEW	5
Management Area Description and Its Fisheries Resources.....	5
Seward Peninsula/Norton Sound Sub-area	5
Kotzebue/Chukchi Sea Sub-area	9
Rural Alaska Sport Fishing.....	14
AYK Sport Fishing Regulations.....	15
Commercial Fisheries	15
Subsistence Fisheries	21
Alaska Board of Fisheries Activities	21
Established Management Plans and Policies	26
Major Issues for the Northwestern Management Area	26
Access Program	27
SECTION II: SPORT FISHING EFFORT IN THE NORTHWESTERN MANAGEMENT AREA	28
Sport Angling Effort.....	28
SECTION III: MAJOR NORTHWESTERN AREA FISHERIES OVERVIEW	32
Northwestern Alaska Salmon Fisheries	32
Regulatory History.....	32
Unalakleet River Salmon Fisheries.....	35
Fishery Description and Historical Perspective	35
Recent Fishery Performance	35
Sport Fishery Management Objectives	37
Current Issues	38
Recent and Ongoing Research and Management Activities	38
Nome Area Roadside Salmon Fisheries	39
Fishery Description and Historical Perspective	39
Recent Fishery Performance	39
Sport Fishery Management Objectives	45
Recent Board of Fisheries and Management Actions	45

TABLE OF CONTENTS (Continued)

	Page
Current Issues	51
Ongoing Research and Management Activities	52
Northwestern Alaska Dolly Varden and Arctic Char	52
Fishery Description and Historical Perspective	52
Recent Fishery Performance	57
Wulik River.....	58
Fishery Objectives and Management.....	58
Recent Board of Fisheries and Management Actions	58
Current Issues	60
Ongoing Research and Management Activities	60
Northwestern Alaska Arctic Grayling	61
Fishery Description and Historical Perspective	61
Recent Fishery Performance	63
Seward Peninsula/Norton Sound Sub-area.....	63
Kotzebue Sub-area	63
Fishery Objectives and Management.....	63
Fishery Outlook	64
Recent Board of Fisheries and Management Actions	64
Current Issues	64
Ongoing Research and Management Activities	65
Kotzebue Sound Sheefish	65
Fishery Description and Historical Perspective	65
Recent Fishery Performance	67
Fishery Objectives and Management.....	69
Fishery Outlook	69
Recent Board of Fisheries and Management Actions	69
Current Issues	69
Ongoing Research and Management Activities	70
Northwestern Alaska Northern Pike	70
Fishery Description and Historical Perspective	70
Recent Fishery Performance	72
Fishery Management Objectives.....	72
Fishery Outlook	72
Recent Board of Fisheries and Management Actions	72
Current Issues	74
Ongoing Research Activities	74
ACKNOWLEDGMENTS	74
LITERATURE CITED.....	74
APPENDIX A	79
APPENDIX B.....	81

LIST OF TABLES

Table	Page
1. Historic commercial salmon harvests by subdistrict from the Norton Sound district 1980-1998	17
2. Kotzebue district chum salmon commercial harvests and incidental Dolly Varden harvests 1980-1998	20
3. Provisional biological escapement goals for Norton Sound area streams	22
4a. Subsistence salmon harvests by subdistrict for the Norton Sound district 1980-1998	24
4b. Subsistence salmon harvests for the Port Clarence and Kotzebue districts 1980-1998	25
5. Sport fishing effort in the A-Y-K region by management sub-areas 1982-1998.....	29
6. Northwest Management Area historic salmon harvests by sub-area 1977-1998.....	33
7. Sport fish effort, harvest, and catch estimates by species for the Unalakleet River, 1990.	36
8. Sport fishing effort in angler-days for major rivers and by sub-area in the Northwest Management Area 1983-1998.	40
9. Sport fish effort and harvests by species from the Nome River 1983-1998, and catches 1990-1998	41
10. Sport fish effort and harvests by species from the Pilgrim River 1983-1998, and catches 1990-1998	42
11. Sport fish effort and harvests by species from the Fish/Niukluk River 1983-1998, and catches 1990-1998.....	43
12. Sport fish effort and harvests by species from the Snake River 1983-1998, and catches 1990-1998	44
13. Sport fish effort and harvests by species from the Solomon River 1983-1998, and catches 1990-1998.....	46
14. Sport fish effort and harvests by species from the Kuzitrin River 1983-1998, and catches 1990-1998.....	47
15. Sport fish effort and harvests by species from the Penny River 1983-1998, and catches 1990-1998	48
16. Sport fish effort and harvests by species from the Cripple River 1983-1998, and catches 1990-1998	49
17. Sport fish effort and harvests by species from the Sinuk River 1983-1998, and catches 1990-1998.....	50
18. Documented subsistence harvests of Dolly Varden in Noatak and Kivalina rivers	54
19. Historic Dolly Varden harvests and catches in NWMA by sub-area 1977-1998	55
20. Aerial counts of Dolly Varden spawning in the Noatak River and overwintering in the Wulik and Kivalina rivers, 1968-1998.....	56
21. Historic Dolly Varden sport fish harvests in the NWMA by sub-area and river, 1988-1998.....	59
22. Historic Arctic grayling harvests and catches in Seward Peninsula/Norton Sound waters, 1988-1998.....	62
23. Historic sheefish harvests and catches from northwest Alaska waters, 1977-1998.....	68
24. Historic northern pike harvests and catches in NWMA by sub-area, 1977-1998.....	73

LIST OF FIGURES

Figure	Page
1. Alaska showing sport fish regions I, II, and III	3
2. The Northwestern Management Area with lines depicting reporting areas W and X	6
3. The Seward Peninsula/Norton Sound sub-area	7
4. Eastern Norton Sound	8
5. Southern Seward Peninsula with road accessible waters	10
6. National Parks and other federal lands in NWMA	11
7. Kotzebue Sound Chukchi Sea sub-area	12
8. Commercial salmon fishing subdistricts in Norton Sound	16
9. Port Clarence commercial fishing district	18
10. Kotzebue commercial salmon fishing district	19
11. Sport fishing effort in angler-days in the NWMA by sub-area, 1977-1998	31
12. Dolly Varden and Arctic char distribution in the NWMA	53
13. Sheefish distribution in the NWMA	66
14. Northern pike distribution in the NWMA	71

LIST OF APPENDICES

Appendix	Page
A. List of Wild and Scenic Rivers in the Arctic-Yukon-Kuskokwim Region	80
B. Northwestern area sport fishing regulations summary for 1997.....	82

PREFACE

The goals of the Sport Fish Division of the Alaska Department of Fish and Game (ADF&G) are to conserve wild stocks of sport fish, to provide a diversity of recreational fishing opportunities, and to optimize social and economic benefits from recreational fisheries. In order to implement those goals the Division has in place a fisheries management process.

This report provides information for the Northwestern Alaska Management Area (NWMA) and is one in a series of reports providing an annual update of fisheries management information about important sport fisheries within Region III. The report is written to make that information available to the State Board of Fisheries, Fish and Game Advisory Committees, the general public, and other interested parties. It presents fisheries assessment information and the management strategies that are developed from that information. In addition, the report includes a description of the fisheries regulatory process, the geographic, administrative, and regulatory boundaries, funding sources, and other information concerning Sport Fish Division management programs within this area.

An annual regional Area Review is conducted in mid-winter during which the current status of important area fisheries are considered and research needs are identified. Fisheries stock assessment research projects are developed, scheduled, and implemented to meet information needs identified by fisheries managers. Projects are planned within a formal operational planning process. Biological information gathered during the course of these research projects is combined with effort information and input from user groups and is used to assess the need for and to develop fisheries management plans and propose regulatory strategies.

Sport Fish Division management and research activities are primarily funded by a combination of State of Alaska Fish and Game (F&G) and Federal Aid in Fisheries Restoration (D-J) monies. The F&G funds are from the sale of fishing licenses. The D-J (Dingle-Johnson, named after the congressmen who wrote the act) funds are from a Federal tax on fishing tackle and equipment. D-J funds are provided to the states at a match of up to three-to-one with the F&G funds. There is also an amendment to the D-J Act (W-B, for Wallop-Breaux) that provides money to states for boating access projects at the same three-to-one match with F&G funds. Funding Source for W-B money is a tax on boat gas and equipment. Other, peripheral funding sources can include contracts with various government agencies and the private sector.

This report provides fisheries information for 1998 with preliminary information from the 1999 season. Following the introduction which includes an overview of the region, is organized into three major sections. **Section I** provides an overview of the Northwestern Alaska Management Area. Included is a description of the management area and sub-areas, Board of Fish activities, and management information and activities within the area. **Section II** provides effort and harvest results for the management area and sub areas. **Section III** provides more detailed summaries of major fisheries and activities occurring during the reporting period. Included in these summaries are a fishery description; a description of recent performance of the fishery; a description of recent Board of Fishery actions related to the fishery; a discussion of social or biological issues that may be associated with each fishery; and a description of ongoing research and management activities related to each fishery.

INTRODUCTION

REGION III DESCRIPTION

The Alaska Board of Fisheries (BOF) divides the state into ten regulatory areas for the purpose of organizing the sport fishing regulatory system by drainage and fishery. These areas (different from Regional Management Areas) are described in Title 5 of the Alaska Administrative Code (5 AAC). Sport Fish Division of the Alaska Department of Fish and Game (ADF&G) divides the state into three administrative Regions with boundaries roughly corresponding to groups of the BOF regulatory areas (Figure 1). Region I is Southeast Alaska. Region II covers portions of Southcentral Alaska, Kodiak, Southwestern Alaska, and the Aleutian Islands. Region III includes two and most of a third of the BOF fishery regulatory areas. They are the Upper Copper and Upper Susitna regulatory area, most of the Arctic-Yukon-Kuskokwim (AYK) regulatory area, and the Tanana River drainage. A portion of the Arctic-Yukon-Kuskokwim regulatory area is excluded from Region III and included in Region II; this is the lower Kuskokwim drainage from the Aniak River downstream and Kuskokwim Bay. After spring 2000, this geographical area will also be included in Region III.

Region III is the largest region, encompassing the majority of the landmass of the state of Alaska (Figure 1). The region contains over 1,251,300 km² (485,000 mi²) of land, some of the state's largest river systems (the Yukon, portions of the Kuskokwim, the Colville, Noatak, Kobuk and upper Copper River and upper Susitna River drainages), thousands of lakes, and thousands of miles of coastline and streams. Regional coastline boundaries extend from Sheldon Point in the southwest, around all of western, northwestern and northern Alaska to the Canadian border on the Arctic Ocean. Region III as a whole is very sparsely populated, with the most densely populated center located in the Tanana River valley. Fairbanks (population about 31,000) is the largest community.

For administrative purposes Sport Fish Division has divided Region III into five fishery management areas (Figure 1). They are:

- (1) The Upper Copper/Upper Susitna Management Area (the Copper River drainage and the Susitna River drainage above the Oshetna River).
- (2) The Upper Tanana River Management Area (The Tanana River drainage upstream from Banner Creek and the Little Delta River).
- (3) The Lower Tanana River Management Area (The Tanana River drainage downstream from Banner Creek and the Little Delta River).
- (4) The Northwestern Management Area (Norton Sound, Seward Peninsula and Kotzebue Sound drainages).
- (5) The AYK Management Area (the North Slope drainages, the Yukon River drainage except the Tanana River drainage, and the Kuskokwim River drainage upstream from the Aniak River).

Area offices for the five management areas are in Glennallen, Delta Junction, Fairbanks, Nome/Fairbanks, and Northwest, respectively.

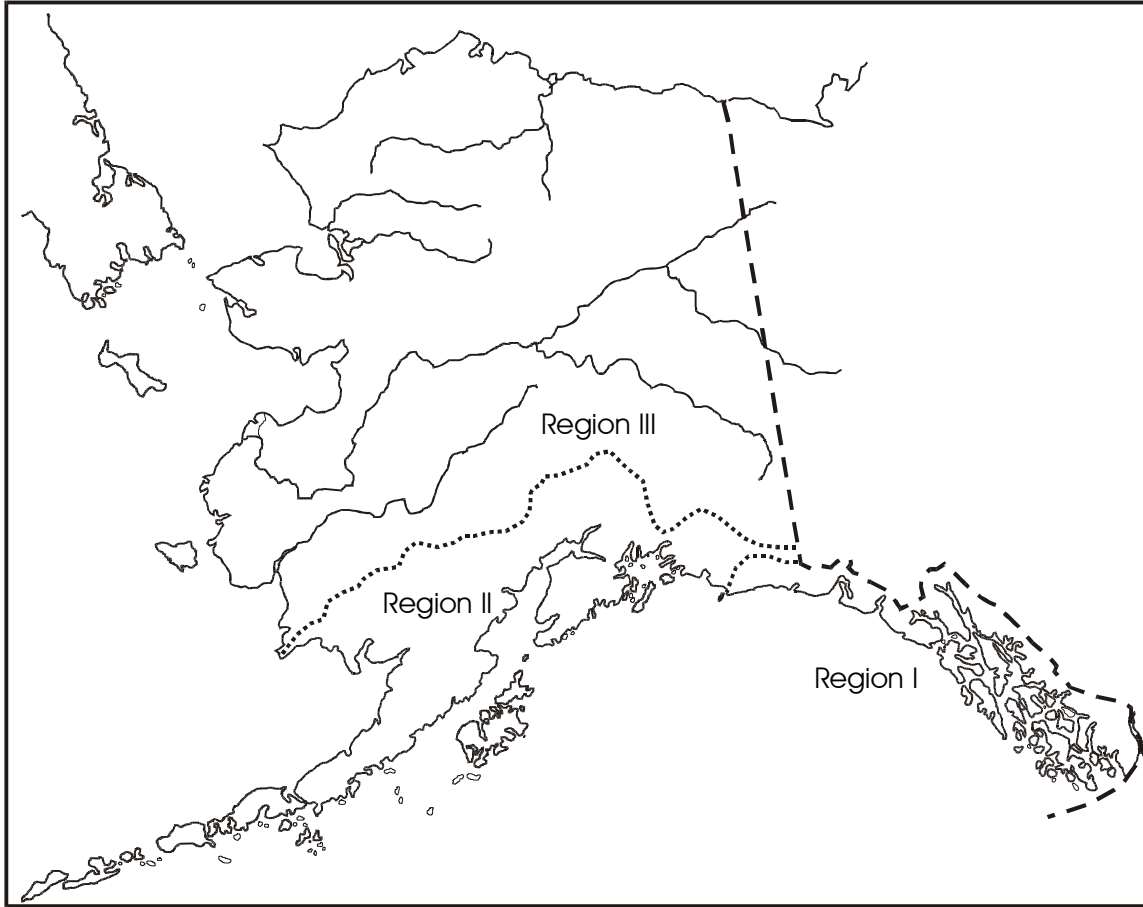


Figure 1.-Alaska showing sport fish regions I, II, and III.

THE ALASKA BOARD OF FISHERIES

The Alaska Board of Fisheries (BOF) is the seven-member board that sets fishery regulations and harvest levels, allocates fishery resources, and approves or mandates fishery conservation plans for the State of Alaska. Board members are appointed by the Governor and must be confirmed by the legislature. Board members are appointed for three years.

Statewide fisheries issues may be considered at any BOF meeting. Under the current operating schedule, the BOF considers fishery issues for regulatory areas or groups of regulatory areas on a 3-year cycle. The BOF meetings are usually in the winter, between early October and late March. Regulation proposals and management plans are received for evaluation by the BOF from ADF&G and the public (any Alaskan can submit a proposal to the BOF), and during its deliberations the BOF receives input and testimony through oral and written reports from staff of the Alaska Department of Fish and Game, members of the general public, representatives of local fish and game Advisory Committees, and special interest groups such as fishermen's associations and clubs.

ADVISORY COMMITTEES

Local Fish and Game Advisory committees have been established throughout the state to assist the Boards of Fish and Game in assessing fisheries and wildlife issues and proposed regulation changes. Advisory committee members are individuals from the local public who are nominated and voted on by all present during an advisory committee meeting. Most active committees in urban areas meet in the fall and winter on a monthly basis; rural committees have generally only one fall and one spring meeting due to funding constraints. Advisory meetings allow opportunity for direct public interaction with department staff who answer questions and provide clarification concerning proposed regulatory changes. The Boards Support Section within the Division of Administration provides administrative and logistical support for the BOF and Fish and Game Advisory Committees. During 1998, the department had direct support responsibilities for 56 Advisory committees in the state.

ADF&G EMERGENCY ORDER AUTHORITY

ADF&G has emergency order (E.O.) authority (5 AAC 75.003) to modify time, area, and bag/possession limit regulations. Emergency orders are implemented to deal with conservation issues that are not adequately controlled by existing regulations. In that scenario, they deal with the issue until it is resolved or the BOF can formally take up the issue. Emergency Orders are also the mechanism by which "in-season" management of fisheries is accomplished. In-season management is usually in accordance with a fisheries management plan approved by the BOF.

REGION III SPORT FISH DIVISION RESEARCH AND MANAGEMENT STAFFING

The Region III Sport Fish Division staff biologists are organized into a research group and a management group. The management group consists of a management supervisor, an area management biologist for each of the five management areas, one or more assistant area management biologists, and two stocked waters biologists. The area biologists evaluate fisheries and propose and implement management strategies through plans and regulations in order to meet division goals. A critical part of these positions is interaction with the BOF, Advisory Committees, and the general public. The stocked waters biologists plan and implement the regional stocking program for recreational fisheries. The research group consists of a research supervisor, research biologists, and various field assistants. The research biologists plan and

implement fisheries research projects in order to provide information needed by the management group to meet division goals.

The Statewide Harvest Survey

Recreational angling effort and catch and harvest of important sport fish species in Alaska has been estimated and reported annually since 1977 (Mills 1979-1994, Howe et al 1995-1999). The Statewide Harvest Survey (SWHS), a questionnaire mailed out to a random selection of sport fish license holders, is the instrument that provides the data analyzed to make these estimates. Estimates for a particular year usually become available in August and September of the following year. Effort, catch, and harvest are estimated on a site-specific basis, but estimates of effort directed toward a single species and the resulting species-specific catch-per-unit-effort (CPUE) information can seldom be derived from the report. Utility of the estimates is strongly dependant on the number of responses for a site (Mills and Howe 1992). Estimates based on 12 or fewer responses are useful only to document that fishing occurred. Twelve to 29 responses produce estimates useful for indicating relative order of magnitude and for assessing long-term trends, and estimates based on 30 or more responses are generally useful.

SECTION I:

NORTHWESTERN MANAGEMENT AREA OVERVIEW

MANAGEMENT AREA DESCRIPTION AND ITS FISHERIES RESOURCES

The Northwest Alaska sport fish management area (Figure 2) includes all waters north of the Yukon River drainage, in Norton Sound, the Seward Peninsula, Kotzebue Sound including the major drainages of the Kobuk and Noatak rivers, and the eastern Chukchi Sea to Point Hope. The total land area consists of approximately 67,800 sq mi (173,500 km²). The management area is comprised of two sub-areas, the Seward Peninsula/Norton Sound sub-area in the south and the Kotzebue /Chukchi Sea sub-area to the north. Fish species present in the Northwest Management Area include anadromous Dolly Varden *Salvelinus malma*, chinook *Oncorhynchus tshawytscha*, coho *O. kisutch*, chum *O. keta*, sockeye *O. nerka* and pink salmon *O. gorbuscha*; Bering cisco *Coregonus laurettae*, humpback whitefish *Coregonus pidschian*, as well as freshwater resident Arctic grayling *Thymallus arcticus*, Dolly Varden *Salvelinus malma*, Arctic char *Salvelinus alpinus*, northern pike *Esox lucius*, sheefish *Stenodus leucichthys*, round whitefish *Prosopium cylindraceum*, least cisco *C. sardinella*, humpback whitefish *C. pidschian*, broad whitefish *C. nasus*, burbot *Lota lota* and lake trout *Salvelinus namaycush*. Most of these species are harvested in sport, personal use or subsistence fisheries. In addition, marine species such as red king crab *Paralithodes camtschatica*, Pacific herring *Clupea harengus*, rainbow smelt *Osmerus mordax*, saffron cod *Eleginus gracilis*, and starry flounder *Platichthys stellatus* are harvested.

Seward Peninsula/Norton Sound Sub-area

The Seward Peninsula-Norton Sound sub-area (statewide harvest Area W; Figure 3) includes all westerly flowing waters and adjacent marine (salt) waters, north of the Yukon River drainage and south of the Selawik River in the Kotzebue Sound/Chukchi Sea sub-area (ADF&G 1984).

Streams in eastern Norton Sound (Figure 4) include the Golsovia, Unalakleet, Egavik, Shaktoolik, Inglutalik, Ungalik and Koyuk rivers. All but the Koyuk, drain the Nulato Hills which separate Norton Sound from the Yukon and Koyukuk River valleys. The Unalakleet

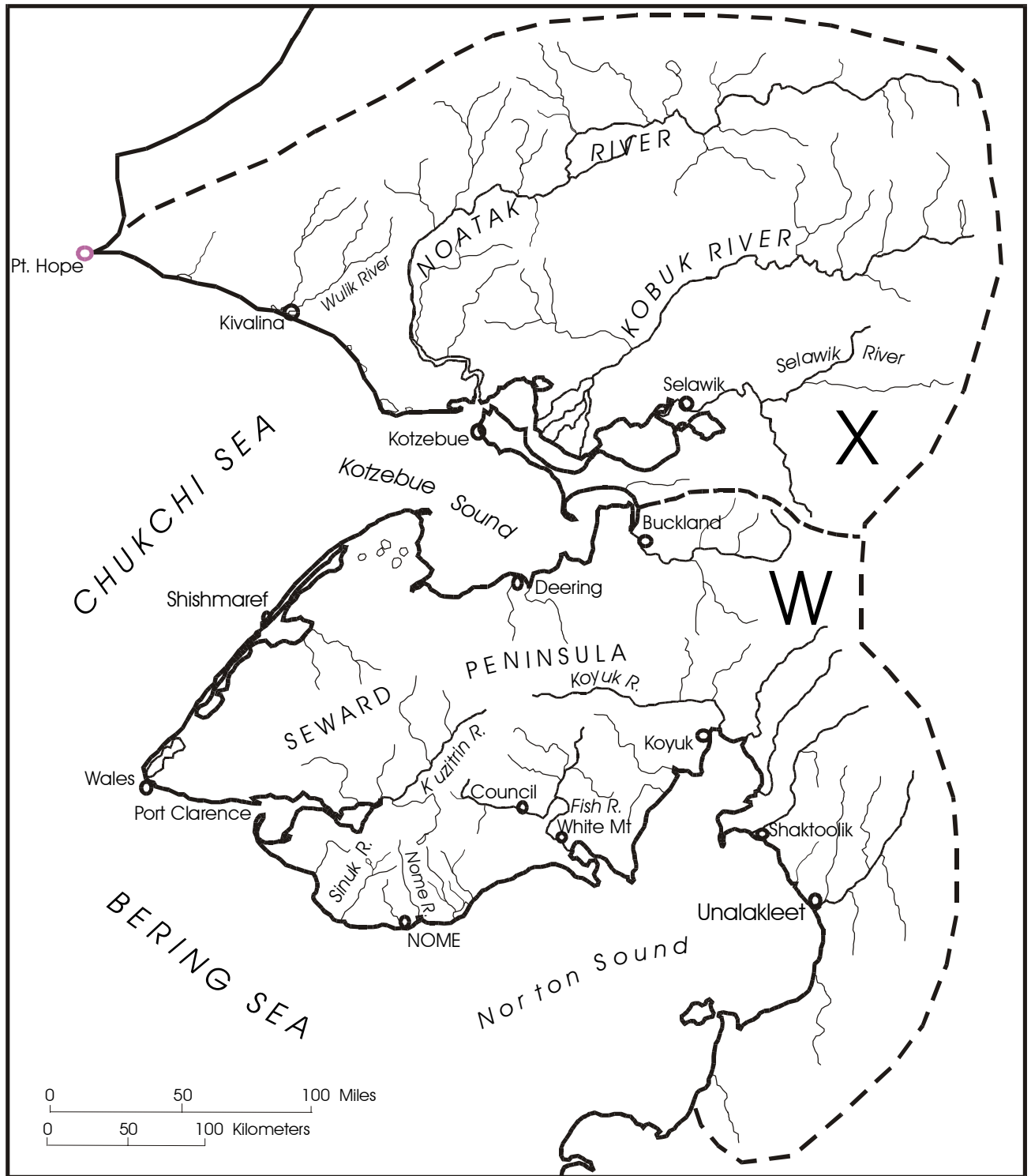


Figure 2.-The Northwestern Management Area with lines depicting reporting areas W and X.

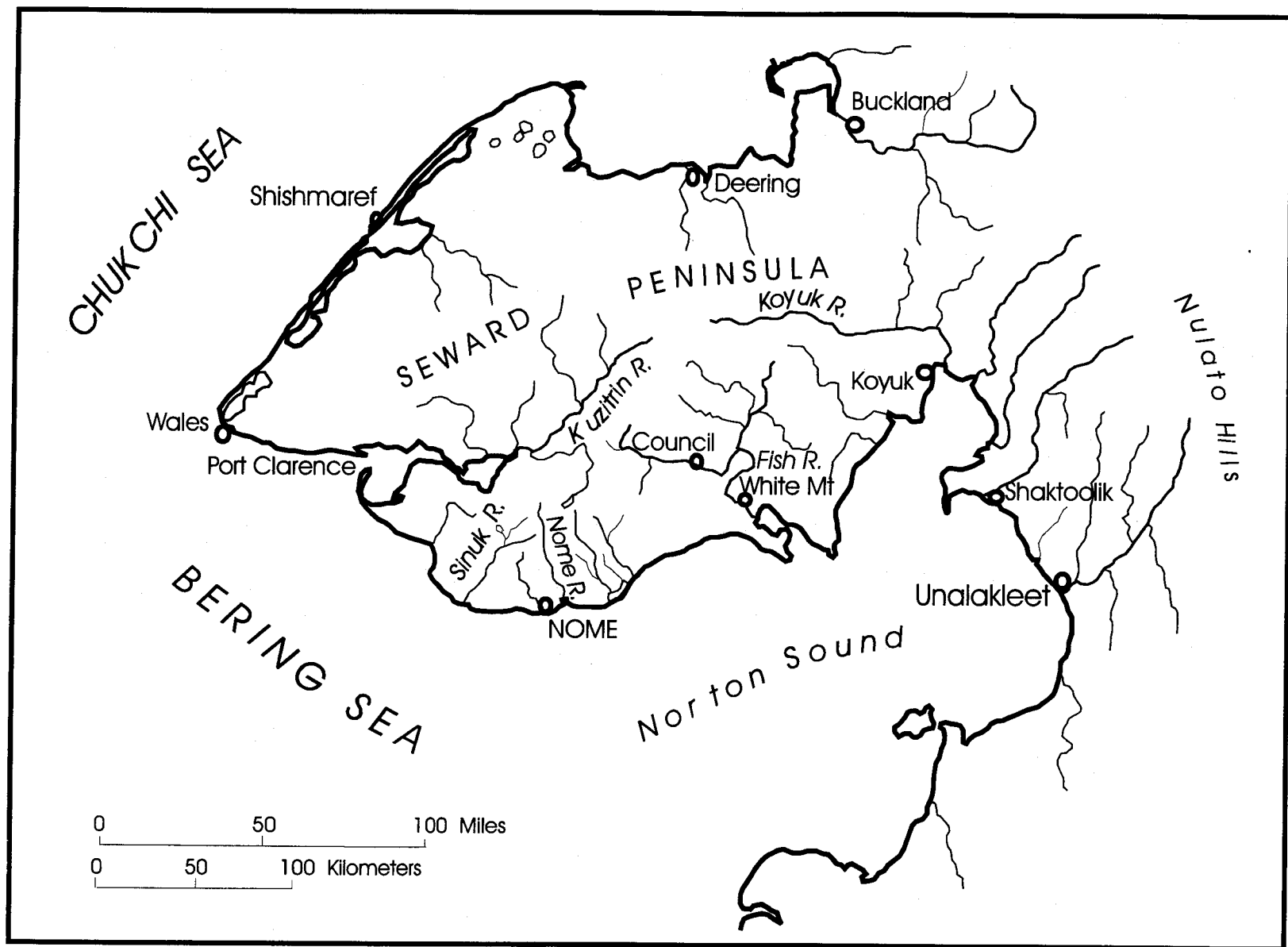


Figure 3.-The Seward Peninsula/Norton Sound sub-area.

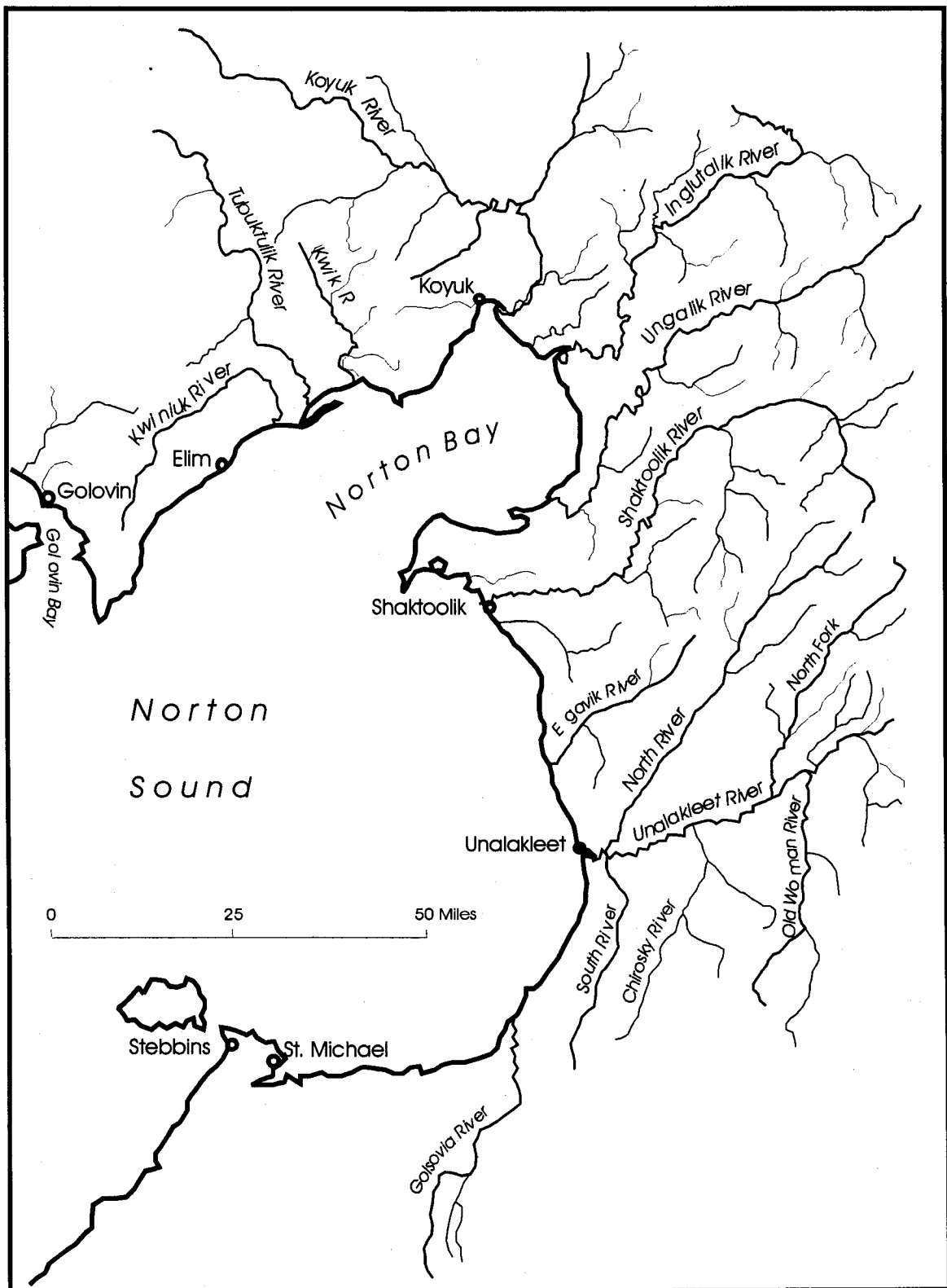


Figure 4.-Eastern Norton Sound.

River is the largest and most heavily utilized of these. The village of Unalakleet is located at the mouth of this river. The Unalakleet River has been designated a National Wild and Scenic River (Appendix A1) and supports anadromous populations of Dolly Varden, chinook, coho, chum and pink salmon and resident populations of Dolly Varden, Arctic grayling and whitefish *Coregonus sp.* Other area streams provide the opportunity for high quality fisheries for the same species, but are not as intensively fished because of their remote nature and difficult access.

Many streams located along the southern half of the Seward Peninsula between Koyuk and Teller, (Figure 5) including the Fish, Niukluk, Bonanza, Eldorado, Nome, Snake, Sinuk, Feather, Tisuk, Pilgrim, and Kuzitrin rivers, are accessible via the Nome road system and offer sportfishing opportunity for Arctic grayling, Dolly Varden, salmon and northern pike (Fish, Pilgrim and Kuzitrin rivers). Small sockeye salmon runs occur in the Pilgrim and Sinuk rivers, and a few remnant late run sockeye are present in most other locations while chinook salmon are present in the Pilgrim and Fish rivers. Trophy Arctic grayling, larger than 1.4 kg (3 lbs), are present in many Seward Peninsula waters and many of Alaska's largest Arctic grayling have been taken there. Of the 110 largest Arctic grayling registered in the ADF&G trophy fish program, 30 were taken from Seward Peninsula waters, and 20 of those were taken from the Sinuk River. Remote streams such as the Koyuk, Tubutulik, Kwiniuk, and Agiapuk rivers are accessible by aircraft or boat from nearby villages. These rivers receive little sport fishing effort but provide opportunity for remote high quality fisheries.

Most of the streams draining the northern half of the Seward Peninsula have never been visited by division personnel but likely have limited sport fishing potential due to relatively small flow volumes and difficult access. Much of the northwestern Seward Peninsula is part of the Bering Land Bridge National Preserve (Figure 6).

Other than thaw lakes on the northern side of the Seward Peninsula, there are few lakes in the sub-area. Unique lake formations include five mar lakes south of Cape Espenberg. These lakes were formed by sub-permafrost steam explosions and contain a combination of Arctic char, least cisco and sticklebacks. The largest inland water body is Imuruk Lake in the north-central portion of the Seward Peninsula. It is approximately 32 km² in area, and drains northward via the Inmachuk River. Salmon spawn at the outlet in the fall and the lake is rumored to contain whitefish and char.

Some small alpine lakes in the Kigluaik Mountains northeast of Nome contain lake resident Arctic char, (Kretsinger 1987) while others contain Dolly Varden (Phillips et al 1999). Glacial Lake in the Sinuk River drainage contains sockeye salmon and round whitefish while Salmon Lake, located about 150 km northeast of Nome in the headwaters of the Pilgrim River, contains sockeye salmon, Arctic grayling, round whitefish, least cisco, slimy sculpin, ninespine stickleback, burbot and Dolly Varden which use it as a migration corridor (DeCicco 1995). Even though this lake can be reached by road, it receives little sport fishing use. However, during the first half of the century it was an important fishing area for gold miners in the area and sockeye were nearly extirpated from the drainage. Subsistence fishing for salmon in Salmon Lake has been prohibited for many years because the sockeye stock was practically eliminated by early fisheries. Sport fishing for salmon in the lake and its tributaries is presently prohibited.

Kotzebue/Chukchi Sea Sub-Area

The Kotzebue/Chukchi Sea sub-area, statewide harvest Area X, includes all waters and drainages of the Selawik, Kobuk, Noatak, Wulik, Kivalina and Kukpuk rivers (Figure 7). The area also

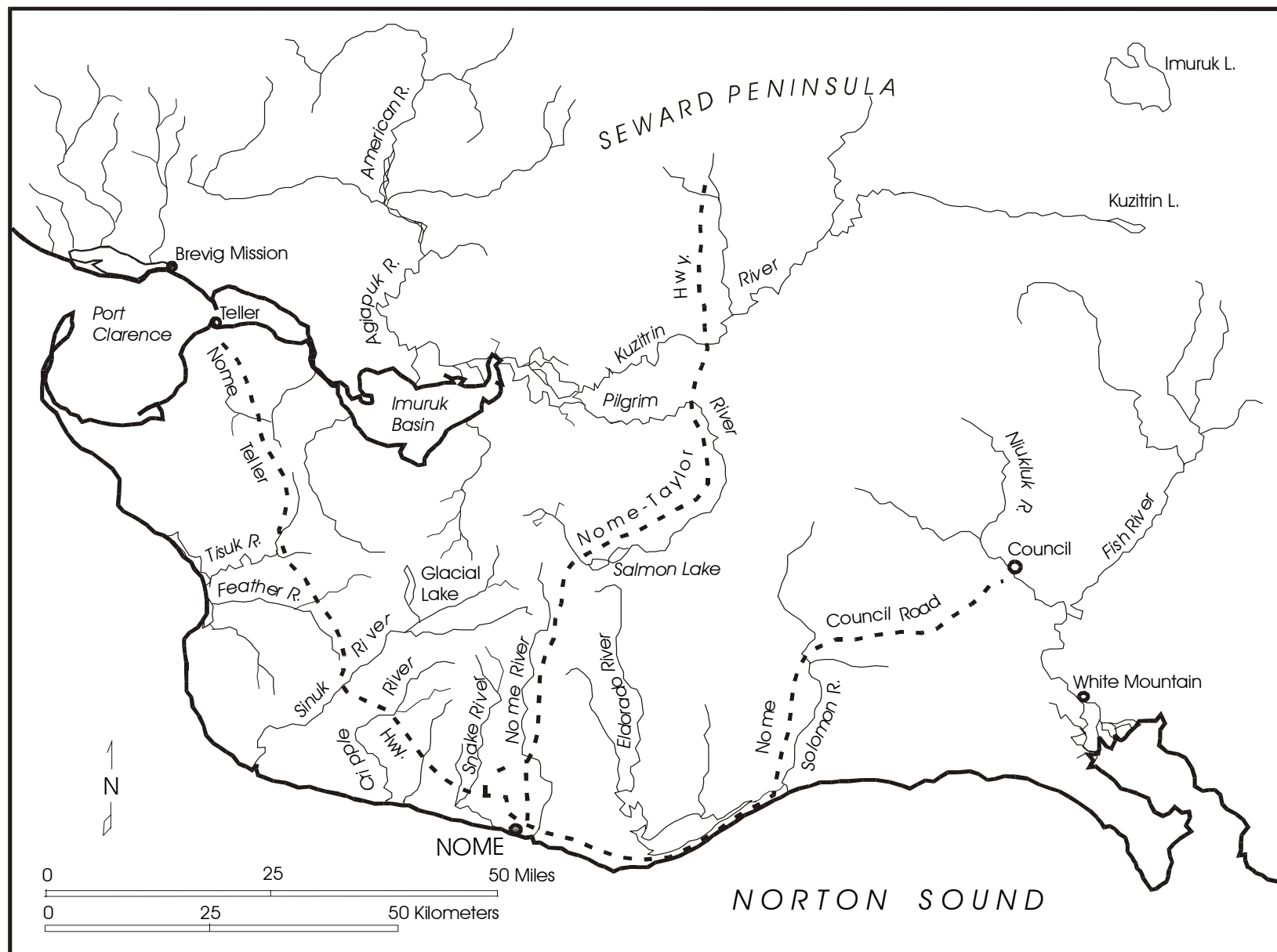


Figure 5.-Southern Seward Peninsula with road accessible waters.

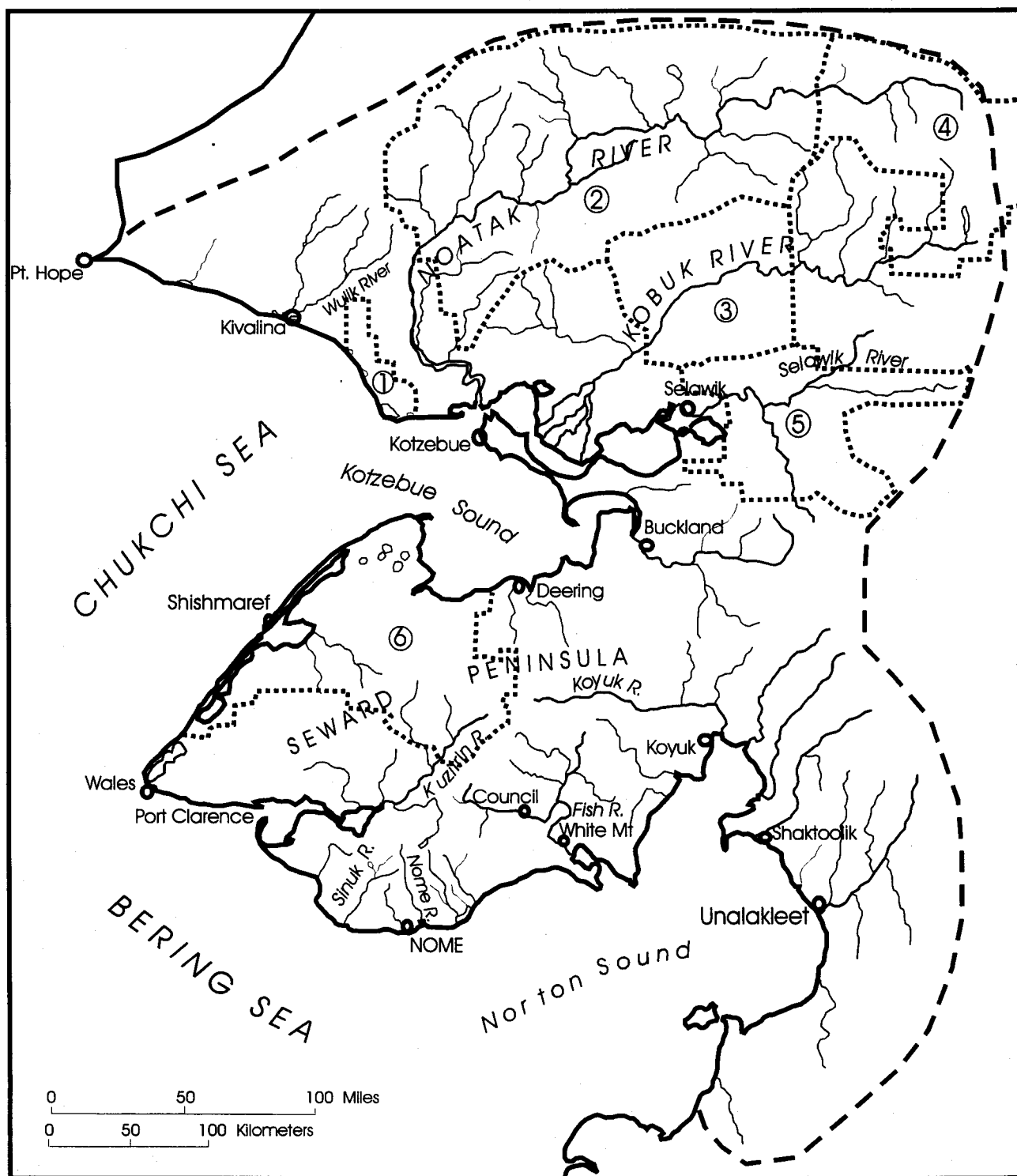


Figure 6.-National Parks Preserves and Wildlife Refuges in NWMA. 1) Cape Krusenstern National Monument, 2) Noatak National Preserve, 3) Kobuk Valley National Park and Preserve, 4) Gates of the Arctic National Park, 5) Selawik National Wildlife Refuge, and 6) Beringland Bridge National Preserve.

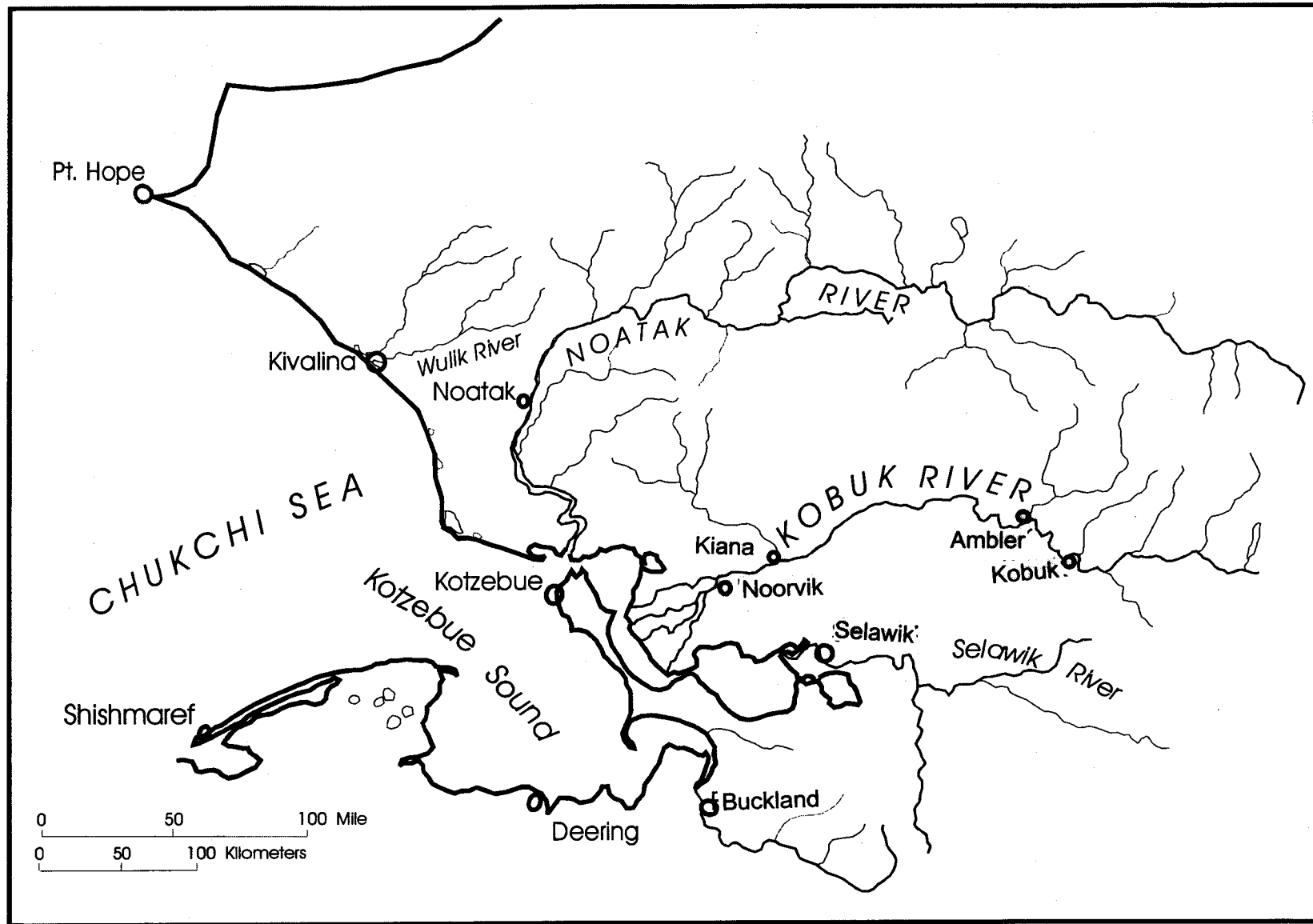


Figure 7.-Kotzebue Sound Chukchi Sea sub-area.

includes all salt water from the northern half of Eschscholtz Bay, including the Chamisso Island area and the northern half of Kotzebue Sound to and including Point Hope (ADF&G 1984).

The most important streams of Kotzebue/Chukchi Sea sub-area are the Noatak and Kobuk rivers, each of which drains approximately 12,000 sq mi (31,000 km²) of the southern and western slopes of the western Brooks Range. Both rivers are approximately 400 mi (640 km) in length (U.S. Army Corps of Engineers 1967). The third largest drainage is that of the Selawik River, with an approximate area of 4,600 sq mi (11,700 km²). Aquifers provide groundwater which stabilizes flow and water temperature fluctuations on the lower main stem of the Noatak River and in tributaries of the Kobuk River. These areas provide important overwintering and spawning habitats for many species of fish.

The Noatak River is a National Wild and Scenic River (Appendix A1) and most of the drainage is included in the Noatak National Preserve (Figure 6). The extreme upper headwaters of both the Noatak and Kobuk rivers are included in the Gates of the Arctic National Park. A portion of the lower Kobuk Valley between Kiana and Ambler is included in the Kobuk Valley National Park, and the Salmon River tributary, as well as the upper main stem of the Kobuk River are National Wild and Scenic Rivers as is the Selawik River. Much of the Selawik River valley is part of the Selawik National Preserve. These three large river systems contain abundant fisheries resources.

The Noatak River produces a large run of chum salmon that contributes to a Kotzebue-based commercial fishery. Many thousands of anadromous Dolly Varden overwinter the lower 300 km of the river and spawn in some of the river's tributary streams. During the commercial salmon fishery in August a significant incidental harvest of adult Dolly Varden is sometimes taken. This system is known for its trophy size Dolly Varden, and the current state record (19.75 lbs.) was taken in 1991 from the Kelly River. Whitefish, Arctic grayling, lake trout, Arctic char, burbot and northern pike are resident in the Noatak River drainage. Sheefish use the lower reaches of the river for feeding during the spring of the year, but are not known to spawn there (Alt 1987).

The Kobuk River also supports a large run of chum salmon that contributes to the Kotzebue commercial fishery. Major spawning areas are located in many of the Kobuk's tributary streams and in the upper part of the main stem of the river. The Kobuk River contains the largest spawning population of sheefish in northwestern Alaska. Sheefish migrate 300 to 400 miles upstream to spawn in the upper reaches of the drainage. Hotham Inlet, Selawik Lake and the delta system at the river's mouth serve as overwinter feeding areas for juvenile and adult sheefish. The Alaska state record sheefish, 24 kg (53 lbs), was taken in 1986 from the upper Kobuk River. Abundant whitefish (*C. sardinella*, *C. nasus*, *C. pidschian*) utilize the river, including Selawik Lake and Hotham Inlet (Kobuk Lake). Whitefish support important subsistence fisheries in villages along the river. Dolly Varden, northern pike, Arctic grayling, burbot, lake trout and Arctic char inhabit various parts of the Kobuk watershed.

The Selawik River also supports a spawning population of sheefish that shares rearing and overwinter feeding areas with the Kobuk population. Sheefish in both populations are slower growing, but attain a larger size than those in other areas of Alaska (Alt 1987). The Selawik River drainage and associated wetlands provide abundant habitat for whitefish (*C. sardinella*, *C. nasus*, *C. pidschian*) and northern pike.

Other important waters in the sub-area include the Wulik and Kivalina rivers, that drain into the Chukchi Sea near the village of Kivalina. These drainages provide rearing, spawning and winter

habitat for diadromous Chukchi Sea Dolly Varden. All five species of North American Pacific salmon, Arctic grayling and whitefish also occur in these relatively small drainages, but populations are not large.

Sport fishing effort in the northern part of the NWMA is relatively light compared to most other areas in the state with heaviest use on the Noatak, Kobuk, and Wulik rivers. Many visitors to Gates of the Arctic National Park and Kobuk Valley National Park participate in float trips on the Kobuk River from Walker Lake to Kobuk village (Alt 1984; ADF&G 1986; National Park Service (NPS) 1984, 1985). A small amount of shore fishing with hook and line for sheefish takes place near Kotzebue in the summer. Guided and unguided anglers and river floaters use the Noatak River as do Kotzebue area residents who boat or fly to different parts of the river to fish or hunt. The most popular fishing area on the Noatak River is the Kelly River, but other tributaries such as the Nimiuktuk and Kugururok rivers are also used occasionally for Dolly Varden fishing (Alt 1978). Raft, canoe, and kayak trips are becoming increasingly popular. Arctic grayling, Dolly Varden, northern pike and lake trout are available in the upper Noatak River, and downstream from the Nimiuktuk River, chum salmon also occur. Lake trout occur in Matcharak, Feniak, and Desperation lakes and in other lakes in the middle and upper Noatak drainage. Some lakes also contain Arctic char. Most lakes in the area are accessible during summer months only by floatplane. Thirteen lakes surveyed by Alt (1978) in the upper Noatak River all contained fish. Round whitefish, lake trout and Arctic grayling were the most common species. Least cisco, northern pike, Arctic char, slimy sculpin *Cottus cognatus*, salmon (chum and sockeye), and ninespine stickleback *Pungitius pungitius* were also found.

The lower floodplains of the Kobuk and Selawik rivers, especially in the vicinity of the Kobuk River delta, and the lower Noatak River contain hundreds of shallow thaw lakes of various sizes. Fisheries resources in this area have been poorly inventoried, but populations of whitefish, and northern pike are known to be seasonally present. Dolly Varden spawn in several Kobuk River tributary streams including the Squirrel, Salmon, Tutuksuk, Hunt and Ambler rivers. The mountains in the upper Kobuk River drainage contain several relatively large, oligotrophic lakes. Lake trout, Arctic grayling, Arctic char, northern pike and several species of whitefish inhabit these lakes which include Walker Lake, Nutuvukti Lake, and Selby Lake.

Most sport fishing throughout the region is by unguided private individuals. The sport fish guiding industry, while present in many of the region's best fishing waters, is not as large or well developed as in other parts of the state. DeCicco and Barnes (1992) produced a list of guide services by area, species and fishery.

RURAL ALASKA SPORT FISHING

With the exception of the limited road system around Nome, waters of the Northwestern Management Area are not accessible from highways or roads of any kind. Small communities are scattered along the major river systems of the area and along the coast of western Alaska. The communities are invariably located on or near water because of the importance of fish as a food source to native people historically and today. Native residents harvest a substantial amount of fish and game resources for personal subsistence use. Subsistence fishing is usually conducted with nylon gillnets or seines. Recreational, or sport fishing with rod and reel is also practiced to some extent by rural residents, but most often as an extension of subsistence activities and less for recreational purposes. Consequently, harvest estimates of sport caught fish from rural Alaska are generally low, in part because local residents usually fish under

subsistence regulations and because the small amount of sport fishing done by them is often considered as part of their normal subsistence activities. Since statewide harvest estimates are based upon surveys of licensed sport fishers, rural harvests may not be fully documented.

AYK SPORT FISHING REGULATIONS

Published regulations for the Northwestern Management Area for 1998 are reproduced as Appendix B.

COMMERCIAL FISHERIES

Although small when compared to the major commercial fisheries in southeast and southwest Alaska, the commercial fisheries in northwest Alaska form an economic base for income and employment in many local communities. Commercial harvests for salmon, herring, halibut and crab are much larger than sport harvests for those species. In addition, extremely limited commercial fisheries exist for freshwater species such as sheefish, Dolly Varden and whitefish. Although personal use fisheries are also allowed, there has been no participation in these fisheries in the NWMA largely because all Alaska residents qualify as subsistence users. Subsistence harvests of salmon, Dolly Varden, sheefish, whitefish and crab are very important to the economies of the many small villages in the NWMA, and are much larger than the sport fish harvests which make up the smallest component of overall use in most years.

The Division of Commercial Fisheries Management and Development (CFMD) manage commercial fisheries in the Northwestern Management Area. Commercial fisheries for salmon in the Norton Sound management district have been ongoing since 1961. The initial species of interest were chinook and coho, but fisheries have also developed for chum salmon and pink salmon. The district is divided into six subdistricts to facilitate management of individual stocks or stock groups. Subdistricts include: 1) Nome, 2) Golovin, 3) Moses Point, 4) Norton Bay, 5) Shaktoolik, and 6) Unalakleet (Figure 8). Conservation concerns for chum salmon stocks have resulted in very little commercial salmon fishing in the Nome subdistrict since the early 1980's. There has likewise been little recent commercial fishing in the Norton Bay subdistrict, but this has primarily been the result of limited markets in this remote area (Brennan et al. 1998). Average harvests over the last five years in the Norton Sound district have been 8,000 chinook, 59,000 coho, 32,000 chum, and 342,000 pink salmon (Table 1). The Port Clarence District includes all waters from Cape Douglas north to Cape Prince of Wales, including the drainages of the Pilgrim and Kuzitrin rivers (Figure 9). Commercial salmon fishing was prohibited in this district in 1967. Few stocks are present and their run sizes are relatively small, however, the sockeye run into Salmon Lake has increased to over 10,000 fish in recent years. Because of the existence of important subsistence fisheries on these stocks, commercial fishing has never reopened. The Kotzebue Sound District includes all waters from Cape Prince of Wales to Point Hope (Figure 10) and is the northern most commercial fishing district in Alaska. The current commercial fishery opened under state management in 1962, but there are documented sales of salmon in the Kotzebue area dating back to the early 1900's. This is primarily a chum salmon fishery with a few chinook taken annually and an incidental take of Dolly Varden that pass through the fishery in August. Average commercial harvests over the past five years in the Kotzebue Sound District have been 148,500 chum salmon and about 1,200 Dolly Varden (Table 2). There is also a directed under ice commercial fishery on sheefish in Hotham Inlet. Documented annual harvests in this fishery have averaged only 250 fish over the past five years,

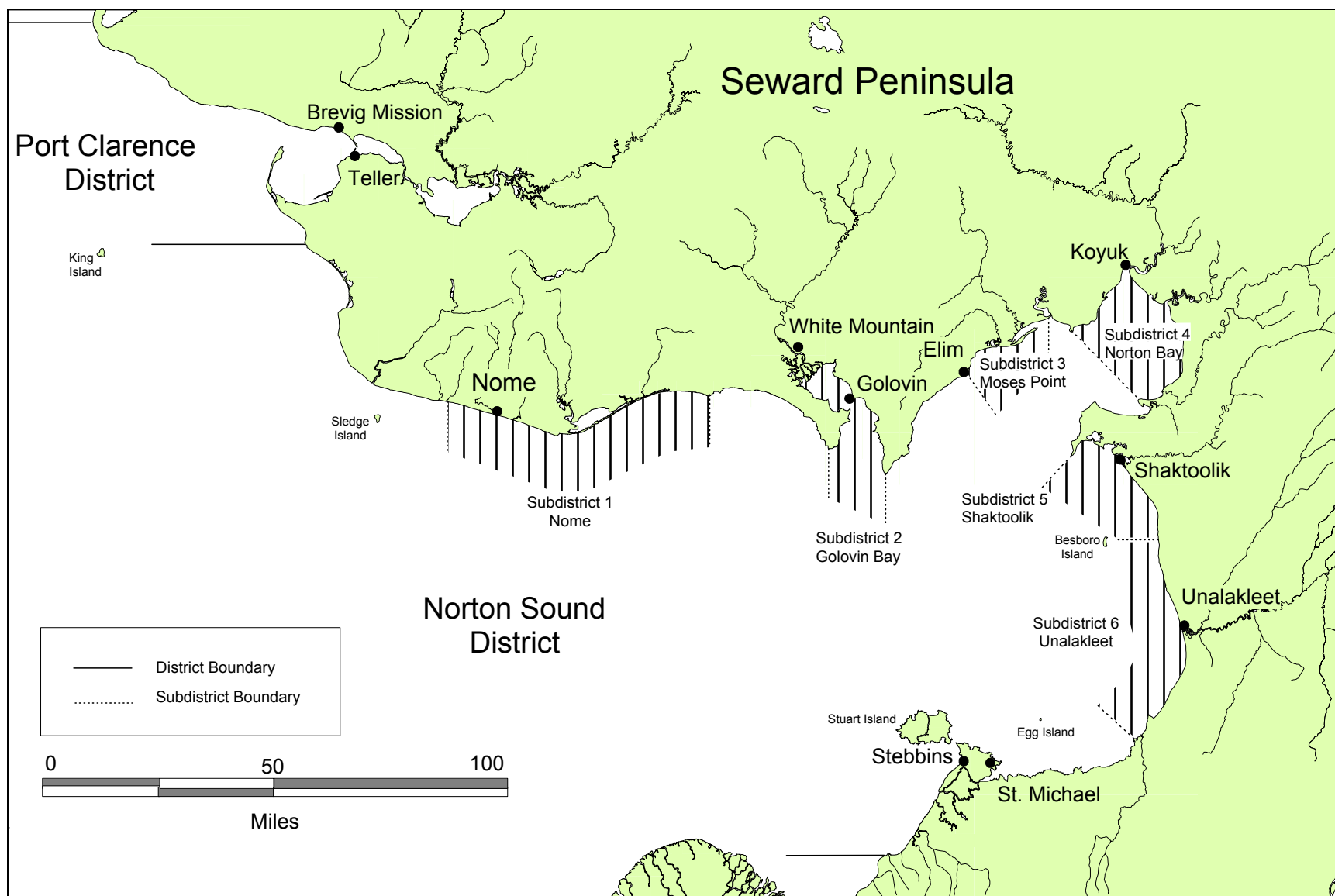


Figure 8.-Commercial salmon fishing subdistricts in Norton Sound.

Table 1.-Historic commercial salmon harvests^a by subdistrict from the Norton Sound district 1980-1998.

Year	Nome (Subdistrict 1)					Golovin (Subdistrict 2)					Moses Point (Subdistrict 3)				
	CH	SO	CO	PS	CS	CH	SO	CO	PS	CS	CH	SO	CO	PS	CS
1980	8			10,007	23,937	36	36	328	10,744	52,609	502			1,435	14,755
1981	4		508	3,202	22,380	23	5	13	49,755	58,323	198		5	26,417	29,325
1982	20		1,183	18,512	33,162	78	5	4,281	39,510	51,970	253		318	9,849	40,030
1983	23		261	308	12,283	52	10	295	17,414	48,283	254			17,027	65,776
1984	7		820		4,571	31		2,462	88,588	54,153			5,959	28,035	9,477
1985	21		356		6,596	193	113	1,196	3,019	55,781	816	32	1,803	559	24,466
1986	6		50		8,216	81	8	958	25,425	68,725	600	41	5,847	15,795	20,668
1987	3		577		6,226	166	51	2,203	1,579	44,344	907	15	64	568	17,278
1988	2		54	182	1,866	108	921	2,149	31,599	33,348	663	93	3,974	13,703	18,585
1989	2			123	617			0			62				167
1990	0	0				52	21	0	0	15,993	202	0	0	501	3,423
1991	0	0				49	1	0	0	14,839	161	0	0	0	804
1992	1	2	693	185	1,762	6	9	2,085	0	1,002	0	0	3,531	0	6
1993	0	2	611	0	745	1	4	2	8,480	2,803	3	0	4,065	0	167
1994	0	1	287	0	354	0	0	3,424	0	111	0	0	5,345	0	414
1995	0	1	369	0	492	0	0	1,616	4,296	1,987	4	44	3,742	2,962	1,171
1996	0	0	9	13	25	0	0	638	0	0	0	0	1,915	68,609	0
1997	0	0	0	0	0	19	2	102	20	8,003	844	0	1,409	0	2,683
1998	0	0	0	0	0	1	0	3	106,761	723	105	0	1,462	145,699	2,311
1993-97 Avg	0	1	225	3	65	4	1	1,156	2,559	2,581	170	9	3,295	14,314	887
1988-97 Avg	1	1	202	50	332	24	96	1,002	4,436	7,809	194	15	2,655	9,531	2,772

^a Harvest data from Brennan et al. 1999.

CH = chinook salmon, SO = sockeye salmon, CO = coho salmon, PS = pink salmon, and CS = chum salmon

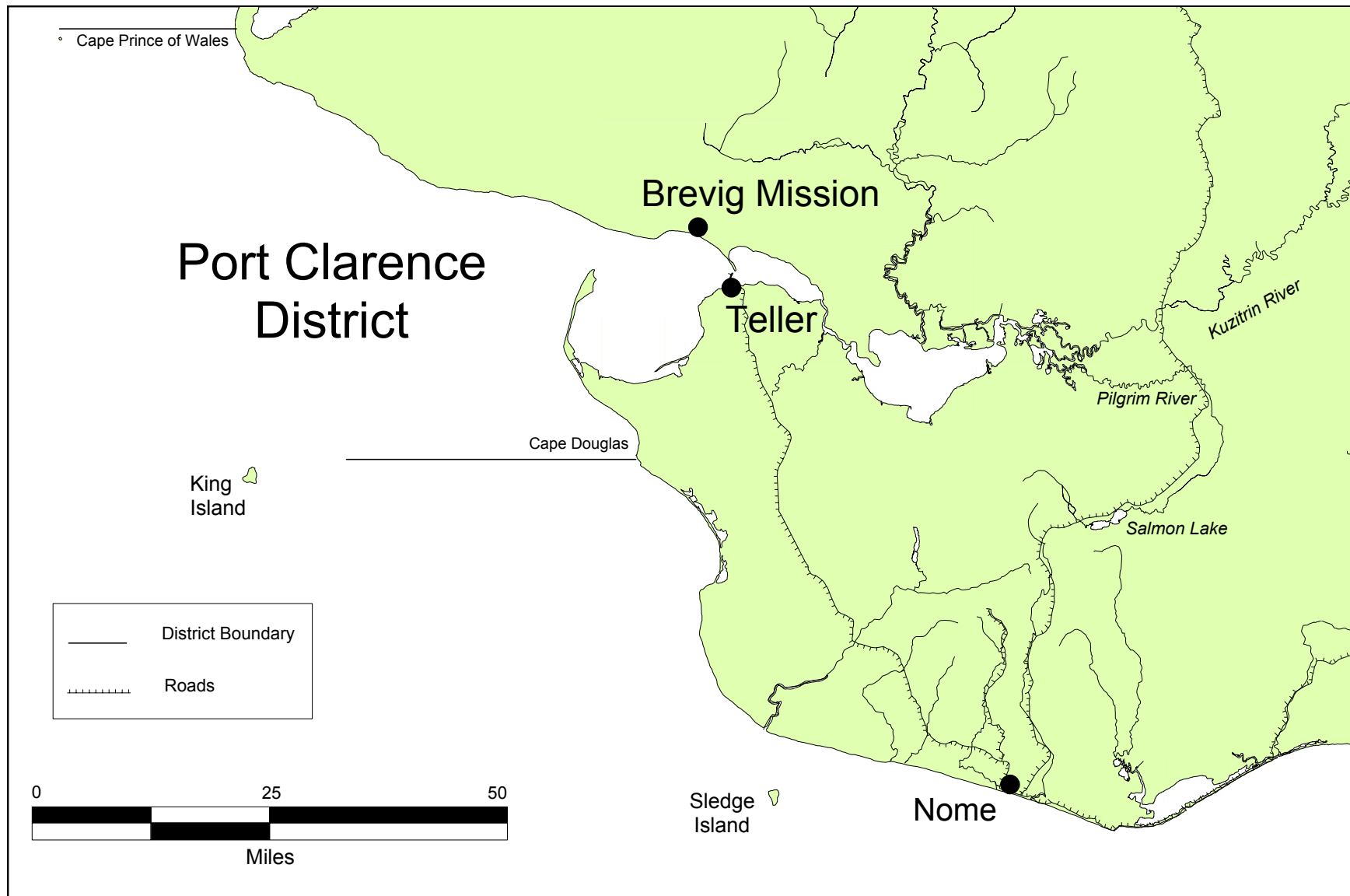


Figure 9.-Port Clarence commercial fishing district.

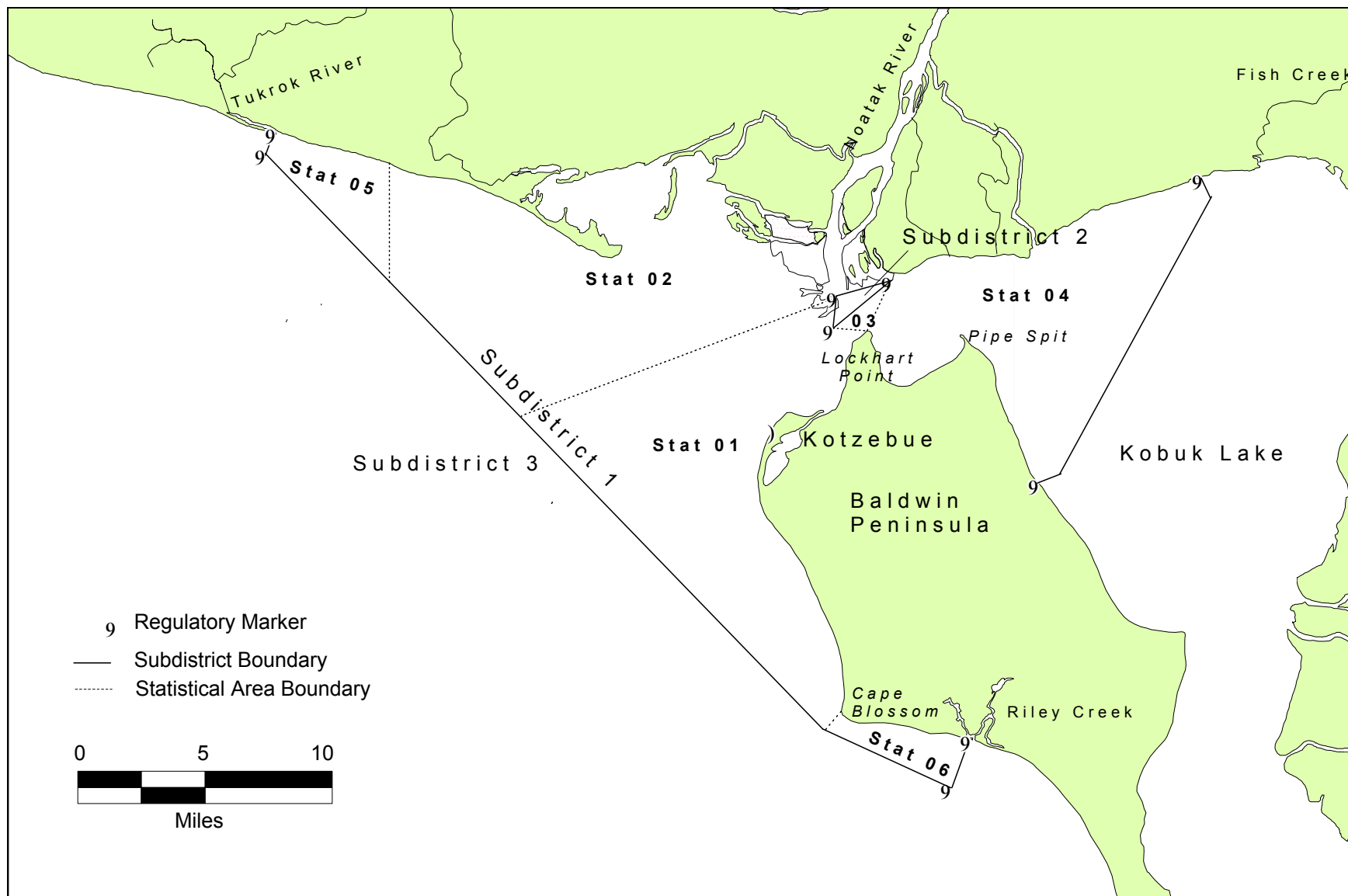


Figure 10.-Kotzebue commercial salmon fishing district.

Table 2.-Kotzeube district chum salmon commercial harvests^a and incidental Dolly Varden harvests 1980 –1998.

Year	Chum Salmon	Dolly Varden	
		Sold	Caught
1980	367,284	3,049	
1981	677,239	3	
1982	417,790	3,447	
1983	175,762	190	1,090
1984	320,206	347	3,600
1985	521,406	454	2,373
1986	261,436	5	
1987	109,467	1,261	
1988	352,915	752	
1989	254,617	3,093	
1990	163,263	604	
1991	239,923	6,136	
1992	289,184	1,977	
1993	73,071	76	
1994	153,452	149	
1995	290,730	2,090	
1996	82,110	188	
1997	142,720	3,320	
1998	55,907	349	
93-97 Avg	148,417	1,165	
88-97 Avg	204,199	1,839	

^a Data from Brennan et al. 1999.

and the harvest quota of 25,000 pounds has never been met. Brennan et al. (1998) documents these fisheries in greater detail.

The CFMD conducts annual assessments of salmon escapements using counting towers and aerial surveys. Escapement goals for chum salmon have been established for Norton Sound streams and are currently under review. In addition, Biological Escapement Goals (BEG's) have recently been developed for other salmon species (Table 3). Most of the proposed BEG's are based on aerial survey data, but will be revised using tower counts when sufficient data are available.

SUBSISTENCE FISHERIES

There are approximately 16,000 people in the NWMA. Except for the two larger communities of Nome and Kotzebue, the population is scattered among 26 small villages along the coast and the major area rivers (Alaska Dept. of Labor 1991). Most of the population is comprised of Alaska Natives, many of whom lead a relatively traditional lifestyle. Most area residents rely heavily on the subsistence use of fish and wildlife for their livelihood. Subsistence use of salmon is monitored in village surveys conducted by the Division of Subsistence. Recent subsistence salmon harvests have averaged about 114,000 in the Norton Sound District; 12,000 in the Port Clarence District; and 58,000 in the Kotzebue Sound District (Table 4). More than 240,000 salmon were taken for subsistence use in Northwestern Alaska during 1996. In addition to salmon, saffron cod, rainbow smelt, Dolly Varden and whitefish are taken. In the Kotzebue District sheefish are also an important subsistence resource, especially in the villages along the Kobuk River, Kotzebue, and Selawik. The relative importance of whitefish is higher in the Kotzebue Sound District than in many areas of the state. The 1997 subsistence harvest of whitefish was estimated at 84,851 for the village of Noatak and the five Kobuk River villages combined.

ALASKA BOARD OF FISHERIES ACTIVITIES

The development of regulations for recreational fisheries in the NWMA occurs within the established Alaska Board of Fisheries (BOF) process. Local fish and game advisory committees have been established throughout Alaska to assist the BOF by bringing local issues to their attention, and proposing or commenting on regulation changes proposed for upcoming meetings. Active committees meet at least once a year and in the fall prior to scheduled BOF meetings in order to provide timely information regarding regulation proposals or concerns that may affect a local area. Staff from the various divisions of ADF&G are often invited to attend committee meetings, to interact with the public, and to provide information to the committee regarding issues of local concern. Within the NWMA there are eight local advisory committees to serve resource users of the area: Kotzebue, Noatak/Kivalina, Upper Kobuk, Lower Kobuk, Northern Seward Peninsula, Norton Sound, Southern Norton Sound and St. Lawrence Island advisory committees.

The current BOF schedule provides for meetings rotated through areas of the state on a 3-year schedule. The last BOF meeting which addressed the NWMA occurred in December 1997. The BOF adopted several regulations that affected sport fisheries in the NWMA during that meeting. Two regulations dealt with salmon fisheries, and two with Arctic grayling. The daily bag and possession limit for chinook salmon was set at one fish for the entire NWMA. In northern Norton Sound, the daily bag and possession limits for "other salmon" was changed from an aggregate limit to a bag limit by species. Fishing for Arctic grayling was closed on the Nome

Table 3.-Provisional biological escapement goals for Norton Sound area streams.

Location	Chum Salmon			Coho Salmon			Chinook Salmon		
	BEG	Type	Range	BEG	Type	Range	BEG	Type	Range
Sinuk River	4,500	UAS ^a	3,600-7,200	550	UAS	400-700	none		
Snake River ^b	1000	UAS	800-1,600	none			none		
Nome River ^c	2,000	UAS	1,600-3,200	none			none		
Eldorado ^b and Flambeau Rivers (combined)	8,500	UAS	5,200-10,400	none			none		
Bonanza River	1,500	UAS	1,000-1,900	none			none		
Fish, Niukluk ^b and Boston Creek (combined)	28,000	UAS	23,200-46,400	none			150	UAS	100-200
Niukluk River ^b (includes Ophir Creek)				1,200	UAS	900-1,500	none		
Kwiniuk River	19,500	CTE ^d	15,600-31,200	800	UAS	600-1,000	350	CTE	250-450
Tubutulik River	12,000	UAS	13,600-27,200	700	UAS	550-900	none		
Old Woman River (Unalakleet tributary)	2,000	UAS	none	none			none		
Unalakleet River	13,000	UAS	none	none			700	UAS	550-900
North River ^b (Unalakleet tributary)	none			none			300	UAS	250-400
Salmon Lake	none			none			none		
Glacial Lake	none			none			none		
Shaktoolik River	none			none			none		

-continued-

Table 3.-Page 2 of 2.

Location	Sockeye Salmon			Pink Salmon		
	BEG	Type	Range	BEG	Type	Range
Sinuk River	none			none		
Snake River ^b	none			none		
Nome River ^c	none			13,000	WCE ^e	Minimum
Eldorado ^b and Flambeau Rivers (combined)	none			none		
Bonanza River	none			none		
Fish, Niukluk ^b and Boston Creek (combined)	none			none		
Niukluk River ^b (includes Ophir Creek)	none			8,400	CTE	Minimum
Kwiniuk River	none			12,500	CTE	Minimum
Tubutulik River	none			none		
Old Woman River (Unalakleet tributary)	none			none		
Unalakleet River	none			none		
North River ^b (Unalakleet tributary)	none			8,500	CTE	Minimum
Salmon Lake	5,000	UAS	3,800-6,300	none		
Glacial Lake	1,000	UAS	750-1,250	none		
Shaktoolik River	none			48,000	CTE	Minimum

^a Unadjusted aerial survey count.

^b Will be redefined as counting tower estimate when data are sufficient.

^c Will be redefined as weir count estimate when data are sufficient.

^d Counting tower estimate.

^e Weir count estimate.

Table 4a.-Subsistence salmon harvests^a by subdistrict for the Norton Sound district 1980 – 1998.

Year	Nome (Subdistrict 1)					Golovin Bay (Subdistrict 2)					Moses Point (Subdistrict 3)				
	CH ^b	So ^c	CO ^d	PS ^e	CS ^f	CH	SO	CO	PS	CS	CH	SO	CO	PS	CS
1980	129		2,157	22,246	5,983	12		692	10,727	4,057	131		229	4,232	1,393
1981	35	14	1,726	5,584	8,579	8		1,520	5,158	5,543	32		2,345	6,530	2,819
1982	21	6	1,829	19,202	4,831	7		1,289	4,752	1,868	1		1,835	3,785	3,537
1983	74	53	1,911	8,086	7,091										
1984	83	16	1,795	17,182	4,883										
1985	56	114	1,054	2,117	5,667	12	2	430	1,904	9,577	67		1,389	1,212	947
1986	150	107	688	8,720	8,085										
1987	200	107	1,100	1,251	8,394										
1988	63	133	1,076	2,159	5,952										
1989	24	131	469	924	3,399										
1990	58	234	510	2,233	4,246										
1991	83	166	1,279	194	3,715						312		2,153	3,555	2,660
1992	152	163	1,481	7,351	1,684						100		1,281	6,152	1,260
1993	52	80	2,070	873	1,766						368		1,217	1,726	1,635
1994	23	69	983	6,556	1,673	253	168	733	8,410	1,337	322	104	1,180	9,345	3,576
1995	36	211	1,897	486	5,344	165	34	1,649	7,818	10,373	284	17	1,353	2,046	3,774
1996	19	353	1,317	5,802	4,333	86	134	3,014	17,399	2,867	417	52	1,720	9,442	2,319
1997	19	99	534	287	4,996	138	427	555	4,570	4,891	619	50	1,213	1,314	2,064
1998	15	14	1,057	4,797	964	184	37	1,292	13,340	1,893	414	49	1,831	6,891	1,376
Avg 93-97	30	162	1,360	2,801	7,976	128	153	1,190	7,639	3,894	402	45	1,337	4,775	2,645
Avg 89-97	53	164	1,162	2,687	7,776										

^a Data from Brennan et al. 1999.

^b CH = Chinook.

^c SO = Sockeye.

^d CO = Coho.

^e PS = Pink Salmon

^f CS = Chum Salmon.

Table 4b.-Subsistence salmon harvests^a for the Port Clarence and Kotzebue districts 1980 – 1998.

Year	Port Clarence District					Kobuk River	Kotzebue District Chum Salmon		
	CH	SO	CO	PS	CS	Villages	Noatak	Kotzebue	Villages
1980	7	3,195	5	3,170	1,715	8,494	2,135	2,387	455
1981	8	255	110	765	5,845	9,459	5,465	4,099	1,017
1982	23	405	100	4,345	684	19,648	5,479	347	419
1983	17	261		615	299	5,486	4,035	88	2,140
1984						7,231	6,049	13,494	573
1985						17,411		36,311	
1986						12,901	1,246		
1987						7,067	2,921		
1988						13,723			
1989	28	535	472	395	410	3,894	1,595		
1990						4,353	3,921		
1991						11,103	3,637		
1992						12,260	2,043		
1993						12,160	3,270		
1994	181	1,979	1,692	3,849	2,042	26,612	6,126		3,488
1995	76	4,481	1,739	3,293	6,011	38,867	6,359	50,708	6,947
1996	195	4,558	2,079	2,587	1,264	39,076	10,091	50,573	
1997	158	3,177	829	755	2,099	26,242	5,309	26,355	
1998	287	1,665	1,759	7,812	2,621	21,398	2,614	24,986	
Avg 1993-97	153	3,549	1,585	2,621	2,854	28,591	6,231	42,545	
Avg 1988-97						18,829	4,706		

^a Data from Brennan et al. 1999.

CH = chinook salmon, SO = sockeye salmon, CO = coho salmon, PS = pink salmon, and CS = chum salmon

and Solomon rivers. In addition, a special meeting to hear local concerns regarding salmon issues in northern Norton Sound was held in Nome during March 1998. That meeting resulted a Teir II subsistence harvest plan for chum salmon in the Nome area during the 1999 season.

The area management biologist has emergency order authority (5AAC 75.003) which allows the in-season modification of time, area, and bag/possession limit regulations as necessary to address conservation concerns on a species, area or fishery basis. Emergency orders issued in the NWMA during the reporting period are summarized in Appendix C, and mentioned in the following sections of this document addressing specific fisheries.

ESTABLISHED MANAGEMENT PLANS AND POLICIES

There are presently no specific BOF adopted management plans that pertain to the NWMA sport fisheries. However, the Division of Sport Fisheries has developed objectives for the region or its constituent areas and have identified them in fishery based management plans. In addition, a series of general divisional criteria that have been prepared to guide the establishment of fishery objectives which are listed below:

1. **Protection and management of existing fish resources.** Divisional activities should strive to manage and protect Alaska's wild stocks of fish resources for future generations.
2. **Public use and benefits of existing fish resources.** Alaska's fishery resources should be made available for public use and benefit on a sustained yield basis.
3. **Rehabilitation of depressed stocks and damaged habitat.** Division activities should strive to restore and maintain fish stocks and habitat damaged by man's activities.
4. **Enhancement of natural production or creation of new opportunities.** The Division should pursue creation of new sport fishing opportunities through rehabilitation of natural stocks or creation of new fisheries where these opportunities do not negatively affect other fisheries.

Management plans prepared for specific NWMA fisheries also identify a series of fishery objectives. While in some cases the objectives are different, objectives that recur frequently in the plans include:

1. Management of sport fisheries so that harvests do not jeopardize sustained yield of the harvested stocks;
2. Maintenance, and/or improvement of public access to fishing opportunities;
3. Promote awareness of sport fishing opportunities that exist; and,
4. Ensure that management costs do not outweigh the public benefits that may be achieved in the fishery.

Existing management plans are scheduled to be updated in the near future.

MAJOR ISSUES FOR THE NORTHWESTERN MANAGEMENT AREA

1. Nome subdistrict salmon. Chum salmon stocks in the Nome subdistrict have been depressed since the mid 1980's. Fisheries divisions of the department have been cooperating in the recovery of these stocks. Efforts, including egg incubation boxes, fishery closures and increased escapement monitoring are ongoing. A lake fertilization project on Salmon Lake to increase zooplankton production for rearing

sockeye has also been undertaken. Sport Fish Division has participated in these efforts through the Regional Planning Team (RPT), and through cooperation with other divisions.

2. Wulik River Dolly Varden. Development of a world-class zinc deposit at the Red Dog site in the upper Wulik River drainage carries the risk of heavy metal contamination on one of the most important streams in Northwest Alaska for Dolly Varden. There has been concern that heavy metal contamination of Red Dog and Ikalukrok creeks would occur both from natural leaching of the ore body as it was stripped for ore production and from discharge of contaminated waters into the river. A contamination problem in 1989 and 1990 has been controlled with additional waste-water treatment and the construction of a clean water bypass system in Red Dog Creek. Water quality is monitored by the Division of Habitat and mine personnel. The Division of Sport Fish counts Dolly Varden overwintering in the Wulik River annually and collects fish from which tissues are excised for heavy metal analyses.
3. Nome area gold mining. The future development of large scale lode deposits of gold near Nome has the potential to degrade fish habitat in the Snake, Cripple and Solomon river drainages. Interest in mining is directly related to the world price of gold. In the last two years both development interest and the price of gold have declined.
4. Rural resentment of sport fishing and sport anglers. Rural Alaskans often feel resentment toward "outsiders" who come into remote areas traditionally used by local people for subsistence hunting or fishing. They sometimes have a cultural bias against the concept of "sport fishing" and feel that people do not have the right to "play" with food resources. The bias can be particularly strong towards catch-and-release practices and has lead to resentment of sport anglers who wish to fish in remote waters of NWMA, and to proposals that would eliminate catch and release in some fisheries.
5. Effects of federal subsistence fisheries management on sport fishing opportunity in the NWMA. During October 1999, the federal government through the USFWS Office of Subsistence Management took over management of subsistence fisheries on waters within or adjacent to Federal Conservation units. There is concern that a result of this action will be reduced opportunity for sport fishing throughout much of Alaska. Since there is a large amount of Federal Public land within the NWMA, most of which is used by local residents for subsistence purposes, the potential loss of opportunity in many remote areas of the NWMA is of acute concern to anglers and sport fish managers.

ACCESS PROGRAM

The Sport Fish Access Program was initiated nation-wide in 1984 as a result of the Wallop-Breaux Amendment to the Sport Fish Restoration (Dingell-Johnson or D-J) Act. The Sport Fish Access program is comprised of two parts. The first involves major capital improvement projects, such as boat launches, parking areas, camping areas handicap-accessible public fishing docks, access roads and trails, and the purchase or lease of lands or right-of-ways to ensure public access to fishing sites. The second portion of the program is called the Small Access Site Maintenance Project. This annually funded program involves maintaining and upgrading existing angler access sites. Activities include placing and maintaining signs at lake and river

access sites, constructing and maintaining trails, and securing public rights-of way to fishing sites. Portable toilets, picnic tables and trash removal are provided at heavily used roadside sites. At remote sites, this project provides tent platforms and outhouses; it also publishes brochures on fishing and boating opportunities.

To date, few access projects have been proposed for the rural areas of the NWMA, however, the access program is in the process of designing a boat launching facility to be located in the village of Unalakleet.

SECTION II: SPORT FISHING EFFORT IN THE NORTHWESTERN MANAGEMENT AREA

SPORT ANGLING EFFORT

Recreational angler effort has been estimated for the Northwest Management Area with a mail survey since 1977 (Mills 1979-1994, Howe et al. 1995-1999). The results of this survey indicate that effort in the Northwest Management Area has remained more or less stable since 1982, with a slight decline in recent years. Effort over this period has ranged from 20,000 to 30,000 angler days during most years (Table 5, Figure 11). During 1997 and 1998, the total sport fishing effort for the Northwest Management Area was estimated at 17,686 and 17,417 angler days respectively. The fraction of the entire AYK Region (excluding the Upper Copper/ Upper Susitna Area) effort expended in the Northwest Management Area has declined from over 15% in 1992 to approximately 10% in 1997 and 1998 (Table 5). Lower effort in the NWMA during 1997 and 1998 account for the decline. When the Upper Copper/Upper Susitna Area is included in the AYK total, the fraction of effort from the NWMA is about 6%.

The Seward Peninsula and Norton Sound sub-area accounts for most of the sport fishing in the NWMA. Effort in the sub-area has averaged around 20,000 angler days over the past 10 years showing a decline to 13,934 angler days in 1997. The effort remained stable at 13,616 angler days in 1998. The Nome River has sustained more fishing effort than any other stream in the NWMA for seven of the past 10 years. In 1997, the Unalakleet River surpassed the Nome River as the most popular single stream in the management area with 4,417 estimated angler days. This pattern of use continued during 1998 with an estimated 3,795 angler days fished in the Unalakleet River. The Nome River has been closed to fishing for Arctic grayling and chum salmon, and it is likely that these closures have contributed to a reduction of fishing effort on this stream. The Cripple River with an estimated 2,303 angler-days was second most heavily utilized stream in 1998. This is a substantial increase over previous estimates for this stream, 206 and 166 angler days in 1996 and 1997 respectively. Almost all of the sport fishing effort on the Cripple River is generated from a commercially run recreational mining camp that is located at the river's mouth.

In the Kotzebue/Chukchi Sea sub-area, sport fishing effort has been more variable, ranging from 3,700 to 10,200 angler days per year over the past 10 years, and showing a recent decline to about 3,800 angler days in 1997 and 1998 (Table 5). The large drainages of the Kobuk and Noatak rivers support about half of the freshwater effort in this sub-area during most years while smaller drainages such as the Wulik, Kivalina and Selawik sustain the majority of the remainder. Expense of travel, difficulty of access and small human population likely account for the low levels of sport fishing effort reported in this region.

Table 5.-Sport fishing effort in the AYK region by management sub areas 1982-1998.

Year	Arctic-Yukon-Kuskokwim Region ^a							
	Tanana Area		AYK Area					
	Tanana Angler-Days	% A-Y-K	Arctic Angler-Days	% A-Y-K	Yukon Angler-Days	% A-Y-K	Kuskokwim Angler-Days	% A-Y-K
1982	150,530	75.7	4,879	2.5	11,034	5.6	12,244	6.2
1983	144,981	72.8	5,738	2.9	11,070	5.6	12,429	6.2
1984	145,142	72.9	8,344	4.2	6,358	3.2	13,970	7.0
1985	135,745	72.6	4,490	2.4	8,670	4.6	11,358	6.1
1986	144,814	74.4	4,779	2.5	9,381	4.8	11,319	5.8
1987	155,346	71.6	5,256	2.4	7,017	3.2	17,856	8.2
1988	173,706	74.4	2,541	1.1	8,261	3.5	23,494	10.1
1989	185,715	77.5	4,118	1.7	10,712	4.5	16,457	6.9
1990	184,887	75.3	3,764	1.5	15,539	6.3	15,858	6.5
1991	155,662	70.8	7,291	3.3	10,749	4.9	13,055	5.9
1992	120,848	66.5	4,940	2.7	12,831	7.1	14,404	7.9
1993	160,117	72.5	5,600	2.5	14,011	6.3	14,505	6.6
1994	148,633	70.8	5,407	2.6	12,872	6.1	18,117	8.6
1995	201,389	74.5	5,644	2.1	18,677	6.9	16,289	6.0
1996	203,962	74.3	6,205	2.3	14,317	5.2	23,682	8.6
1997	120,452	65.6	5,307	2.9	12,796	7.0	27,423	11.6
1998	117,025	66.4	3,653	2.1	10,127	5.7	27,913	11.6
88-97 Avg.	165,537	72.2	5,082	2.3	13,077	5.8	18,328	7.9
93-97 Avg.	166,911	71.5	5,633	2.5	14,535	6.3	20,003	8.3

-continued-

Table 5.-Page 2 of 2.

Arctic-Yukon-Kuskokwim Region ^a					
Year	Northwest Alaska				A-Y-K Angler-Days
	Seward Pen	%	Kotzebue	%	
	Angler-Days	A-Y-K	Angler-Days	A-Y-K	
1982	13,198	6.6	6,906	3.5	198,791
1983	16,944	8.5	7,963	4.0	199,125
1984	17,436	8.8	7,791	3.9	199,041
1985	19,919	10.7	6,701	3.6	186,883
1986	18,107	9.3	6,313	3.2	194,713
1987	21,413	9.9	10,221	4.7	217,109
1988	20,278	8.7	5,279	2.3	233,559
1989	17,692	7.4	4,932	2.1	239,626
1990	21,799	8.9	3,782	1.5	245,629
1991	23,622	10.7	9,543	4.3	219,922
1992	22,684	12.5	6,145	3.4	181,852
1993	18,930	8.6	7,809	3.5	220,972
1994	18,922	9.0	6,036	2.9	209,987
1995	14,677	5.4	8,495	3.1	270,141
1996	18,637	6.8	7,060	2.6	274,566
1997	13,934	7.6	3,752	2.0	183,664
1998	13,616	7.7	3,801	2.2	176,135
88-97 Avg.	19,118	8.6	6,283	2.8	227,992
93-97 Avg.	17,020	7.5	6,630	2.8	231,866

^a A-Y-K total does not include Copper River drainage.

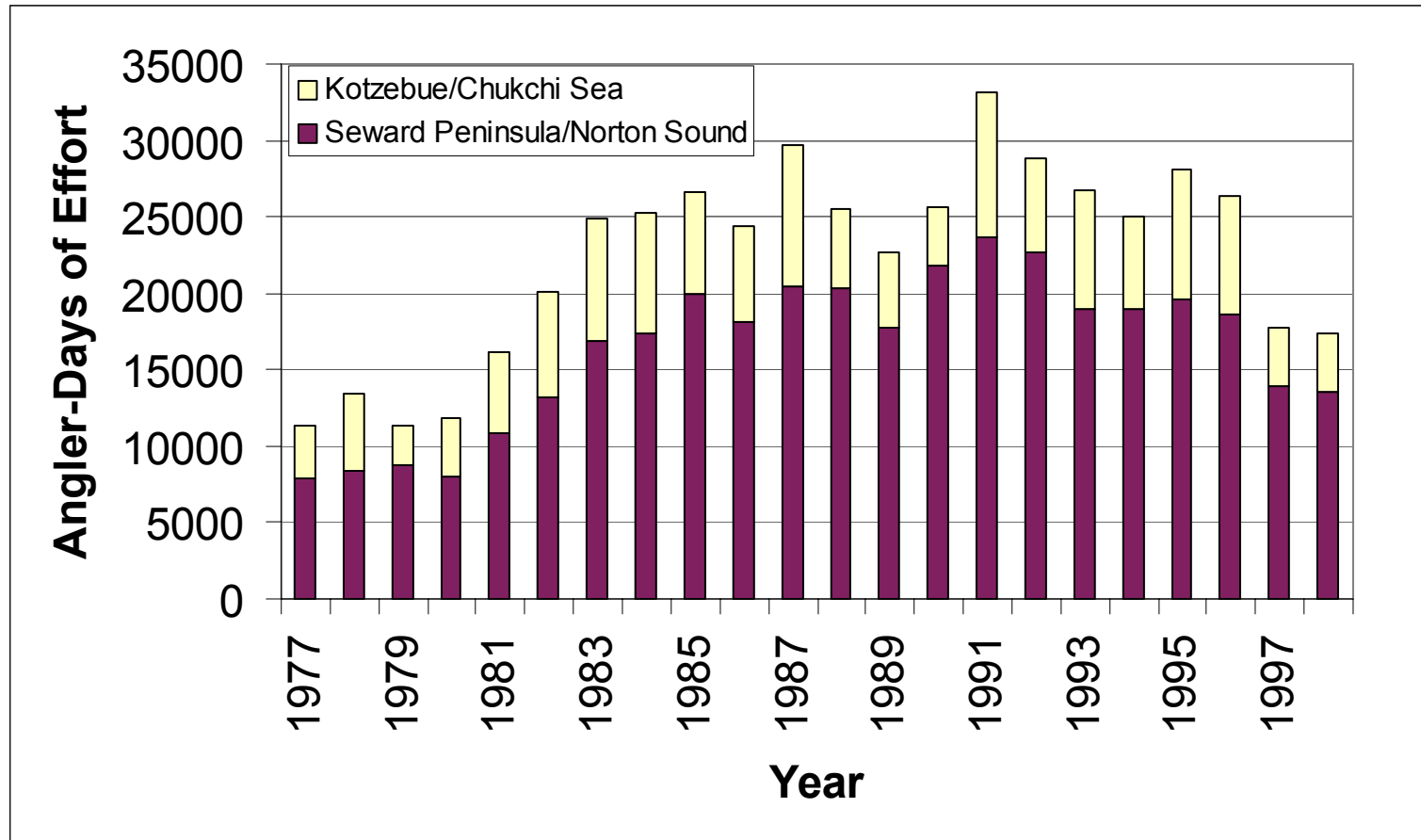


Figure 11.-Sport fishing effort in angler-days in the NWMA by sub-area, 1977-1998.

SECTION III: MAJOR NORTHWESTERN AREA FISHERIES OVERVIEW

NWMA waters offer some of the most remote and diverse angling opportunities available in Alaska. Opportunities to fish for Dolly Varden, sheefish and Arctic grayling in pristine areas without encountering other anglers are widespread. Angling opportunities for salmon, especially chinook and coho are not as well known, but can be excellent seasonally in several Norton Sound streams that produce good runs. Marine sport fisheries, are practically non-existent. Guided fishing comprises a small amount of the effort in northwestern Alaska. An unpublished survey conducted by the Division of Sport Fish for the 1994 season estimated that only about 1% of the total sport fishing effort in the Seward Peninsula-Norton Sound sub-area was by guided anglers while about 5% of the effort in the Kotzebue-Chukchi Sea sub-area was guided. Through the ice jigging for saffron cod, smelt, flounder, sheefish, and other species are common near settlements, but these fisheries generally operate under subsistence fishing regulations. The following sections discuss the major sport fisheries in the NWMA by species and area. Discussion of each fishery will deal with 1) historical perspective, 2) recent fishery performance 3) fishery objectives, 4) fishery outlook, 5) inseason management and recent BOF actions, 6) current issues and 7) recommended management and research programs. Recent fishery performance will focus on data from 1998. Observations regarding the 1999 season may be included for some fisheries, but data on harvest are not yet available. Summaries of historic sport fish harvests and catches are provided by fishery.

NORTHWESTERN ALASKA SALMON FISHERIES

Some guided and nonguided sport fishing for salmon takes place throughout the management area, however the vast majority of salmon fishing occurs in the Seward Peninsula/Norton Sound sub-area with concentrations near Unalakleet, and in waters accessible from the Nome area road system. Some fishing effort occurs in association with wilderness float trips in Kotzebue Sound drainages, but the amount of sport fishing effort expended toward salmon in the northern part of the management area is very light, consequently, harvests are very small.

Total fishing effort estimated to have occurred for all species of fish in the NWMA has ranged from about 11,000 angler-days in the late 1970's to 33,000 angler-days in 1991 (Table 5). Salmon harvest is estimated to have ranged from 3,800 fish in 1977 to 20,000 fish in 1982 (Table 6). Mean annual harvest of salmon of all species from 1987 to 1997 was about 10,000 fish, with 97% of the harvest reported from Seward Peninsula and Norton Sound, and only about 3.0% from Kotzebue drainages. Over the past five years, about 51% of the total average harvest has been coho salmon, 34% pink salmon, 8% chum salmon, and 6% chinook salmon. During years of high pink salmon abundance such as 1992, 1994, 1996, and 1998, harvests of this species have comprised about 50% of the total annual salmon harvest. However, during years of low pink salmon abundance such as 1993, 1995 and 1997 coho salmon have accounted for about 60% of the total salmon harvest (Table 6).

Regulatory History

Prior to 1966, the daily bag limit was 15 fish (of all species) in freshwaters of western Alaska. From 1966 through 1970 an exception was made in the Unalakleet River where the daily bag limit was 6 salmon (all species). In 1970, the 6 salmon limit on the Unalakleet River was dropped, and a 15 salmon limit was adopted for the entire AYK Region with exceptions outside

Table 6.-Northwestern management area historic salmon harvests by sub-area 1977-1998.

	Norton Sound/ Seward Peninsula	Kotzebue	NW Mgmt Area	Norton Sound/ Seward Peninsula	Kotzebue	NW Mgmt Area	Norton Sound/ Seward Peninsula	Kotzebue	NW Mgmt Area	Norton Sound/ Seward Peninsula	Kotzebue	NW Mgmt Area
Year	Effort	Effort	Effort	KS	KS	KS	Coho	Coho	Coho	Chum	Chum	Chum
1977	7,828	3,487	11,315	197	16	213	449	0	449	670	28	698
1978	8,379	4,997	13,376	303	0	303	742	0	742	546	254	800
1979	8,725	2,593	11,318		10			0			27	
1980	7,958	3,841	11,799	52	9	61	1,455	0	1,455	1,601	86	1,687
1981	10,879	5,284	16,163	70	22	92	1,504	0	1,504	1,889	32	1,921
1982	13,198	6,906	20,104	409	0	409	2,986	0	2,986	2,620	346	2,966
1983	16,944	7,963	24,907	687	0	687	3,823	0	3,823	2,042	463	2,505
1984	17,436	7,791	25,227	247	13	260	7,582	0	7,582	1,481	312	1,793
1985	19,919	6,701	26,620	239	0	239	1,177	51	1,228	1,036	310	1,346
1986	18,107	6,313	24,420	1,077	0	1,077	3,926	0	3,926	1,719	749	2,468
1987	20,413	9,288	29,701	615	95	710	2,319	11	2,330	814	402	1,216
1988	20,278	5,279	25,557	400	18	418	5,038	0	5,038	1,583	236	1,819
1989	17,692	4,932	22,624	203	0	203	4,158	0	4,158	1,497	41	1,538
1990	21,799	3,782	25,581	364	0	364	3,305	0	3,305	925	0	925
1991	23,622	9,543	33,165	404	0	404	5,800	0	5,800	1,415	59	1,474
1992	22,684	6,145	28,829	204	8	212	4,671	0	4,671	523	220	743
1993	18,930	7,809	26,739	595	0	595	3,783	9	3,792	691	443	1,134
1994	18,922	6,036	24,958	600	0	600	5,547	0	5,547	536	248	784
1995	19,647	8,495	28,142	438	0	438	3,705	0	3,705	394	321	715
1996	18,637	7,763	26,400	274	0	274	6,801	0	6,801	316	539	855
1997	13,934	3,752	17,686	1,103	0	893	4,386	0	4,386	276	272	548
1998	13,616	3,801	17,417	590	0	590	4,441	0	4,441	682	177	859
Avg (88-97)	19,615	6,354	25,968	459	3	440	4,719	1	4,720	816	238	1,054
Avg (93-97)	18,014	6,771	24,785	602	0	560	4,844	2	4,846	443	365	807

-continued-

Table 6.-Page 2 of 2.

	Norton Sound/ Seward Peninsula	Kotzebue	NW Mgmt Area	Norton Sound/ Seward Peninsula	Kotzebue	NW Mgmt Area	Norton Sound/ Seward Peninsula	Kotzebue	NW Mgmt Area
Year	Pink	Pink	Pink	Sockeye	Sockeye	Sockeye	Total	Total	Total
1977	2,402	8	2,410	0	0	0	3,718	52	3,770
1978	7,399	0	7,399	0	0	0	8,990	254	9,244
1979		0			0			37	
1980	7,732	0	7,732	0	0	0	10,840	95	10,935
1981	3,101	0	3,101	0	0	0	6,564	54	6,618
1982	13,742	0	13,742	0	0	0	19,757	346	20,103
1983	4,583	0	4,583	0	0	0	11,135	463	11,598
1984	8,322	0	8,322	351	0	351	17,983	325	18,308
1985	1,138	68	1,206	20	0	20	3,610	429	4,039
1986	3,172	62	3,234	19	0	19	9,913	811	10,724
1987	1,304	0	1,304	924	21	945	5,976	529	6,505
1988	2,912	0	2,912	782	0	782	10,715	254	10,969
1989	3,564	10	3,574	165	0	165	9,587	51	9,638
1990	7,647	0	7,647	198	0	198	12,439	0	12,439
1991	1,738	91	1,829	237	0	237	9,594	150	9,744
1992	6,403	293	6,696	131	0	131	11,932	521	12,453
1993	2,250	0	2,250	10	0	10	7,329	452	7,781
1994	7,051	51	7,102	18	0	18	13,752	299	14,051
1995	928	38	966	104	0	104	5,569	359	5,928
1996	5,591	0	5,591	22	0	22	13,004	539	13,543
1997	1,454	0	1,454	30	0	30	7,249	272	7,521
1998	6,939	13	6,952	16	0	16	12,668	193	12,861
Avg (88-97)	3,954	48	4,002	170	0	170	10,117	290	10,407
Avg (93-97)	3,455	18	3,473	37	0	37	9,381	384	9,765

the NWMA. Salmon Lake and its tributaries were closed to salmon fishing in 1980. The general 15 salmon daily bag limit in the NWMA remained in effect until 1985 when the king salmon limit was set at 5 per day and the “other salmon” limit was set at 10 per day. An exception was made for the Snake and Nome rivers where the “other salmon” limit was 15 per day of which only 5 could be chum or coho. In 1987 emergency regulations were adopted that set the king salmon daily bag limit at 1 fish and the “other salmon” limit at 10 per day. In 1988, the king salmon daily bag limit for the AYK Region outside the Tanana River drainage was set at 3 per day with only 2 over 28 inches and the “other salmon” limit was retained at 10 per day, however, in Seward Peninsula waters, the king salmon limit was 1 per day with 10 “other salmon” of which only 3 could be chum or coho. Also in 1988, chum salmon fishing was closed by emergency order on the Nome River. This closure was extended to all rivers from the Sinuk to the Solomon in 1991. In 1992, this closure was adopted into regulation by the BOF. These regulations remained in effect until 1997 when the BOF broke out the “other salmon” bag limits for Northern Norton Sound and adopted daily bag limits of 10 pink, 3 coho, 3 sockeye, and 3 chum salmon. The chum salmon closure in the Nome subdistrict remains in effect.

UNALAKLEET RIVER SALMON FISHERIES

Fishery Description and Historical Perspective

The Unalakleet River supports substantial runs of chinook, chum, coho and pink salmon. Guided and nonguided fishing effort is primarily focused on chinook and coho salmon, but chum and pink salmon are also harvested. The City of Unalakleet with a population of about 800 is located on the shore of Norton Sound at the mouth of the river. Daily air service from Anchorage and Nome provides access for anglers visiting the Unalakleet area. The U. S. Air Force operated a sport fishing recreational camp on the Unalakleet River during the 1960's, and a commercial sport fishing lodge was constructed there in the late 1960's. This fishing lodge is still being operated, although it has expanded in size and it has had several owners. The Unalakleet Native Corporation has owned the lodge for several years and contracted operations. The lodge is located about 8 miles upstream on the river, which hosts around 200 visiting anglers each year. Several local residents also guide anglers on the river, and guiding operations from the Yukon drainage sometimes visit the river during the peak of the chinook and coho salmon runs. The majority of angling, however, is by unguided anglers, an unpublished survey by the Division of Sport Fish estimated that only about 8.5% of salmon anglers on the Unalakleet River were guided. The average annual sport harvest of salmon of all species from the Unalakleet River from 1990 to 1998 has been about 3,265 fish. Coho comprised about 80% of the average harvest while chinook made up about 11% (Howe et al. 1995-1999). The harvest increased to about 4,800 salmon in 1997 and 4,140 salmon in 1998 (Table 7), with coho accounting for 56% of the 1997 harvest and 66% of the 1998 harvest.

Recent Fishery Performance

During both 1997 and 1998, the Unalakleet River sustained the highest sport fishing effort of any single river in the NWMA. At 3,795 angler days in 1998, this was a decrease from the 1997 estimate of 4,417 angler days, the second highest on record (Table 7). In 1998, an estimated total of 4,138 salmon were harvested of which 66% (2,742) were coho, and about 12% (513) were chinook. Chum and pink salmon accounted for about 11% of the harvest each (447 and 434 respectively). Approximately 81% of the entire NWMA harvest of chinook salmon, and 50% of the coho harvest were taken from the Unalakleet River in 1998. During 1997, an estimated total of 4,898 salmon were harvested of which 56% (2,779) were coho, 22% (1,053)

Table 7.-Sport fish effort, harvest, and catch estimates by species for the Unalakleet River 1990 – 1998.

	Year									Average	Average
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1990-97	1993-97
Effort											
Number of Anglers	482	917	685	625	777	1,009	827	945	835	783	837
Number of Trips	1,642	3,236	2,256	1,398	2,192	3,376	2,427	3,384	3,197	2,489	2,555
No. Angler Days	3,974	5,616	2,433	2,153	2,349	3,832	3,447	4,417	3,795	3,528	3,240
Harvest											
Chinook Salmon	276	296	117	382	379	259	176	839	513	341	407
Coho Salmon	1,826	2,180	1,555	643	2,425	2,033	2,787	2,779	2,742	2,029	2,133
Chum Salmon	298	497	379	116	220	207	133	227	447	260	181
Pink Salmon	1,180	437	779	89	402	222	58	1,053	434	528	365
Dolly Varden	614	1,648	746	602	679	1,061	1,402	931	588	960	935
Arctic Grayling	99	1,909	114	131	353	300	441	207	144	444	286
Total Fish Harvest	4,293	6,967	3,690	1,963	4,458	4,082	4,997	6,036	4,868	4,561	4,307
Catch											
Chinook Salmon	361	375	476	2,340	517	588	431	5,117	1,539	1,276	1,799
Coho Salmon	3,396	2,882	2,802	1,572	2,488	3,086	4,377	4,008	3,213	3,076	3,106
Chum Salmon	379	692	1,412	515	561	966	969	1,320	2,218	852	866
Pink Salmon	1,513	559	6,503	605	1,020	799	2,611	4,093	4,853	2,213	1,826
Dolly Varden	2,222	2,267	1,942	964	1,253	2,732	2,473	4,374	2,225	2,278	2,359
Arctic Grayling	448	2,813	1,022	874	1,476	1,332	1,670	4,890	3,256	1,816	2,048
Total Fish Catch	8,319	9,588	14,157	6,870	7,315	9,503	12,531	23,802	17,304	11,511	12,004

were pink salmon, 17% (839) were chinook and 5% (227) were chum. The chinook salmon run usually begins in mid-June, peaks during the last week of June and continues through mid-July. Anglers access the river by boat from the village of Unalakleet and are comprised of a mix of local residents, visitors who rent boats or fish with friends, and visitors who either stay at the Unalakleet Lodge or are guided by local resident guides. Most sport fishing effort occurs in the lower 15 miles of the Unalakleet River and in the lower 5 miles of the North River which enters the Unalakleet about 7 miles upstream from its mouth. The 1997 estimated harvest of 839 chinook was the second highest on record. During 1998, the estimated harvest was 513 chinook (Table 7). The 1997 chinook run was one of the strongest on record. The total escapements of chinook into the Unalakleet River were estimated for the first time in 1997 and 1998 by expanding the tower estimate from the North River to include the entire drainage based on proportions of radio tagged fish moving up each drainage. In 1997 and 1998, chinook escapement into the Unalakleet River was estimated at 11,204 and 5,220 respectively.

Over the past five years (1993-1997) the commercial harvests of chinook salmon in the Unalakleet subdistrict has averaged 6,134 fish (Table 1). Over the course of the fishery since 1961, harvests have ranged from 960 in 1969 to 12,621 in 1985. In 1997, 9,067 chinook were harvested in this fishery, and in 1998, 6,413 were taken. Commercial fish managers believe that some of the harvest from Yukon stocks that mill in Norton Sound before moving up the Yukon River. Records of subsistence harvests of chinook salmon in Unalakleet have ranged from 90 fish in 1966 to 6,325 fish in 1997 (Table 4a). The recent five-year average (1993-1997) harvest was 4,398 fish. The 1998 subsistence harvest was 3,963 fish. The sport fish harvest over the same period has averaged 325 fish or about 2.5% of the total Unalakleet harvest.

Coho are the most sought after salmon species in the Unalakleet drainage. The run usually begins around August 1, peaks during mid-August and continues through early September. The sport harvest of coho averaged 2,200 fish from 1993 to 1997, but has continually increased over the last four years. The 1998 estimated harvest of 2,742 coho was similar to the 1997 harvest of 2,779 and are among the highest on record (Howe et al. 1995-1999). The coho fishery is more consumptive than other Unalakleet salmon fisheries. Approximately 70% of coho caught are harvested while about 40% are chinook, 23% chum salmon, and 20% pink salmon (1993-97 average) of chinook, chum and pink salmon caught are harvested.

From 1994-1998 commercial harvests of coho salmon in the Unalakleet subdistrict have averaged 41,022 fish (Table 1). Since 1961, commercial harvests have ranged from 79 in 1964 to 71,019 in 1994 (Table 1). The commercial harvest has trended downward over the past three years. In 1997, 26,079 were harvested, and in 1998, 24,534 were taken. Subsistence harvests of coho salmon in the community of Unalakleet averaged 12,315 fish between 1994 and 1998. The 1998 harvest was 7,303 fish. The sport fish harvest over the same period has averaged 2,748 fish, or about 5% of the total Unalakleet harvest. Reliable escapement data for coho salmon in the Unalakleet drainage are not available.

Sport Fishery Management Objectives

There have been no specific management objectives identified for salmon fisheries on the Unalakleet River. In comparison to commercial and subsistence salmon harvests, harvests in the sport fisheries are small and have a limited impact on salmon stocks. The only possible exception is the coho harvest, however, escapement data are lacking, and it is not possible to determine the impact of the sport harvest on the spawning escapement. The goal of sport fishery management in the Unalakleet River is to maintain opportunity for anglers to participate in the

fisheries. Emergency actions to restrict harvest are generally not contemplated unless other harvests, and escapement monitoring projects indicate that the run is small and that restrictions in subsistence fisheries may be necessary in order to allow for sufficient spawning escapement. Biological Escapement Goals (BEG's) based on tower estimates are being developed, but will not be established until more years of reliable tower count data have been accumulated. When BEG's are in place, more precise management to attain those goals will become possible.

Current Issues

Although sport fishing has been ongoing in the Unalakleet River drainage for many years, there is some local resentment of visiting anglers because some Unalakleet residents feel that "outsiders" are competing for what residents feel are "their" salmon. Declines in chum and coho salmon runs throughout western Alaska have impacted the Unalakleet River drainage, although the effect appears to be less dramatic than in Nome subdistrict streams where chum runs have a long history of being depressed. While the commercial harvests of chinook in the Unalakleet Subdistrict have remained relatively stable, the commercial harvests of coho have declined during the past three years with the 1998 harvest of 24,534 being the lowest on record since 1988. The "other salmon" bag limit of 10 fish, while it may be appropriate for pink salmon during years of high abundance, is felt by some to be excessive, especially for coho. A proposal will be brought before the BOF to reduce the "other salmon" limit to five per day. In 1998, about 24% of the coho salmon captured in the Unalakleet River were released. A department study (Vincent-Lang et al. 1993) found high levels of catch and release mortality with coho captured in estuarine waters. Local residents have expressed concern about mortality of fish captured and released in sport fisheries in the lower reaches of the Unalakleet River, and a proposal to eliminate the release of sport caught fish in the Unalakleet River is likely to be submitted to the BOF. The upper reaches of the Unalakleet River are a National Wild and Scenic River under federal management. With the recent federal takeover of subsistence management on federal waters, the possibility exists that subsistence management may be extended downstream and that actions may occur that will affect sport fishing opportunity in the Unalakleet River.

Recent and Ongoing Research and Management Activities

Salmon escapements in the Unalakleet River are monitored using a counting tower in the North River, a test net in the Unalakleet River downstream from the mouth of the North River, and by aerial surveys. The tower is a cooperative project funded and operated by the Kawarek Corporation with guidance by the ADF&G. Aerial surveys are difficult in the Unalakleet River because of its dark bottom and tannic stained water, they provide a minimum escapement, but are unreliable as a total escapement estimate in this river. Water in the North River is clear, and the tower provides a reliable estimate of escapement into that system in years for which counts are obtained.

A two-year research project was initiated on the Unalakleet River in 1997 to estimate the proportions of the chinook salmon escapement that spawn in the North River and the main Unalakleet River upstream from the North River. In 1997, 37.2% of the radio tagged chinook spawned in the North River, and 62.8% spawned in the remainder of the drainage (Wuttig 1998). Proportions estimated in 1998 were similar, 40.1% in the North River and 59.9% in the remainder of the Unalakleet drainage. These relative proportions can now be used to expand the North River tower estimate to allow estimation of the escapement in the entire system. The sport fish staff has frequently assisted and cooperated informally with the Commercial Fisheries

Division on projects, including the partial funding of counting towers from which spawning escapements are estimated, surveys for abundance, and observation of spawning concentrations. Emergency orders restricting the harvest of salmon are usually coordinated with the Commercial Fisheries Division. There have been no emergency orders that have affected Unalakleet River salmon sport fisheries during the reporting period and there have been no recent Board of Fisheries actions affecting salmon fisheries on the Unalakleet River.

NOME AREA ROADSIDE SALMON FISHERIES

Fishery Description and Historical Perspective

Nine rivers accessible from the road system near Nome sustain some level of sport fishing effort for salmon. Estimated harvests from these rivers have averaged about 7,800 salmon annually, of which coho and pink salmon have comprised about 85%. In all but the last two years, the Nome River has sustained more sport fishing effort than any other single water body in northwestern Alaska because of its proximity to Nome and the adjacent road. Sport fishing on the Nome River has accounted for an annual average of 22% of all the fishing effort in the entire northwestern management area since 1983 (Table 8). An average of about 2,600 salmon have been harvested annually from the Nome River over the past 10 years, approximately 80% have been pink salmon (Table 9). The Fish/Niukluk rivers is also a popular sport fishing location for salmon. Two guiding operations with small lodges are located on the Niukluk River. In addition, Nome based guides fish these rivers as well as other road accessible waters. Many residents of Nome have summer cabins on the Niukluk River at Council or fish camps along the river. Since the construction of the bridge over Safety Sound in 1980, and improvements to the road, access to the Fish/Niukluk rivers has increased, and this area has become a prime destination for the road bound angler. The drainage sustains an average annual effort of about 2,400 angler days. About 1,400 salmon are harvested annually from the Fish/Niukluk rivers. The Pilgrim River, with its headwaters at Salmon Lake is another popular salmon fishery. All five species of North American Pacific salmon occur in the Pilgrim River. Sockeye spawn in Salmon Lake and the runs appear to be responding positively to lake fertilization restoration efforts currently underway. There is a Bureau of Land Management campground at the outlet of Salmon Lake, and from there the river can be floated for about 25 river miles to the bridge at mile 65 of the Kougarok Road. Riverboats can be launched at the bridge for access to downstream locations. The Pilgrim River sustains an average annual effort of about 1,150 angler days and about 250 salmon are harvested annually (Table 10). The Fish/Niukluk and the Pilgrim rivers are rivers where fishing for chum salmon is still allowed, however annual (1993-1997 average) harvests have been only 15 chums from the Pilgrim and 162 chums from the Fish/Niukluk (Table 11). The mouth of the Snake River is in downtown Nome, and this small stream can be accessed from a bridge at about mile 8 of the Teller Road and from the Glacier Creek Road. The Snake River sustains an average annual effort of about 1,300 angler days, with an annual harvest of about 450 salmon, about half coho and half pink salmon (Table 12). Other road accessible waters include the Solomon, Kuzitrin, Penny, Cripple and Sinuk rivers (Tables 13 – 17). The annual harvests in these rivers combined for the past five years (1993-1997) have averaged 375 coho, 8 chum, 8 chinook, and 385 pink salmon. During years of high pink salmon abundance (even years) this species dominates catches and harvests in some Nome roadside streams.

Recent Fishery Performance

The alternate year strong pink salmon run in Norton Sound strongly influences the salmon sport fishery on road accessible streams. This relationship is strongest in the Nome River because of

Table 8.-Sport fishing effort in angler days for major rivers and by sub-area in the Northwestern Management Area.

Year	Seward Peninsula/Norton Sound Sub-Area							Kotzebue/Chukchi Sea Sub-Area					NWMA
	Nome	Fish/Niukluk	Unalakleet	Snake	Pilgrim	Others	Total	Noatak	Kobuk	Wulik	Others	Total	Total
1983	3,908	1,999	4,146	119	597	6,175	16,944	1,372	3,609	805	2,177	7,963	24,907
1984	5,714	1,115	2,421	418	732	7,036	17,436	1,805	2,834	677	2,475	7,791	25,227
1985	6,514	889	5,750	361	375	6,030	19,919	3,470	2,297	550	384	6,701	26,620
1986	6,023	1,888	6,457	850	868	2,021	18,107	2,141	2,646	168	1,358	6,313	24,420
1987	1,865	2,473	942		1,159	14,974	21,413	3,584	5,133	303	1,201	10,221	31,634
1988	6,058	2,245	1,219	2,128	4,822	3,806	20,278	2,492	2,100	455	232	5,279	25,557
1989	6,569	2,124	1,701	436	1,678	5,184	17,692	2,552	1,729	107	544	4,932	22,624
1990	7,194	2,059	3,957	775	1,710	6,104	21,799	1,423	1,306	285	768	3,782	25,581
1991	4,646	2,524	5,616	2,384	3,183	5,269	23,622	4,235	2,353	93	2,862	9,543	33,165
1992	6,455	2,742	2,433	2,379	1,184	7,491	22,684	2,611	2,095	469	970	6,145	28,829
1993	3,633	3,962	2,153	1,468	1,195	6,519	18,930	3,013	2,604	350	1,842	7,809	26,739
1994	5,116	3,082	2,349	880	844	6,651	18,922	2,747	1,153	762	1,374	6,036	24,958
1995	3,044	2,603	3,832	1,968	1,253	6,947	19,647	2,504	3,681	647	1,663	8,495	28,142
1996	4,279	2,809	3,447	1,686	1,348	5,068	18,637	2,622	2,057	345	2,739	7,763	26,400
1997	1,924	3,042	4,417	447	825	3,279	13,934	1,166	828	559	1,199	3,752	17,686
1998	1,371	1,344	3,795	376	546	6,184	13,616	610	2,053	202	936	3,801	17,417
1983-97 Avg.	4,863	2,370	3,389	1,164	1,452	6,170	19,331	2,516	2,428	438	1,453	6,835	26,166
1993-97 Avg.	3,599	3,100	3,240	1,290	1,093	5,693	18,014	2,410	2,065	533	1,763	6,771	24,785

Table 9.-Sport fish effort and harvests by species from the Nome River 1983-1998, and catches 1990-1998.

Year	Number of Anglers	Days Fished	King Salmon	Coho Salmon	Red Salmon	Pink Salmon	Chum Salmon	All Salmon	Dolly Varden	Arctic Grayling	Whitefish
Harvest											
1983	0	3,908	93	204	0	1,782	538	2,617	2,468	464	0
1984	1,288	5,714	13	2,648	0	4,128	325	7,114	935	376	13
1985	1,220	6,514	20	209	0	349	189	767	1,236	528	0
1986	1,087	6,023	0	415	0	491	76	982	1,057	491	0
1987	674	1,865	0	163	0	235	0	398	906	344	0
1988	1,733	6,058	0	1,455	0	528	273	2,256	2,365	946	18
1989	1,231	6,569	19	1,233	0	1,573	495	3,320	3,551	2,032	131
1990	1,625	7,194	39	407	35	2,651	122	3,254	1,078	33	0
1991	1,277	4,646	22	417	0	356	241	1,036	1,220	186	13
1992	1,433	6,455	16	713	0	4,397	0	5,126	573	0	0
1993	1,181	3,633	93	602	0	723	0	1,418	917	0	0
1994	1,025	5,116	0	326	0	4,103	0	4,429	431	16	0
1995	859	3,044	0	143	0	230	0	373	462	0	0
1996	1,100	4,279	0	616	0	3,425	0	4,041	715	0	0
1997	788	2,747	11	322	0	189	0	522	291	0	0
1998	636	1,371	0	189	0	1,985	0	2,174	302	0	0
Avg 1988-97	1225	4974	20	623	4	1818	113	2578	1160	321	16
Avg 1993-97	991	3764	21	402	0	1734	0	2157	563	3	0
Catches											
1990	1,625	7,194	48	896	35	5,483	825	7,287	2,271	613	0
1991	1,277	4,646	22	869	0	894	389	2,174	3,725	1,363	13
1992	1,433	6,455	23	1,466	0	9,810	266	11,565	1,130	90	9
1993	1,181	3,633	121	764	0	1,756	175	2,816	5,153	569	0
1994	1,025	5,116	0	386	0	6,190	36	6,612	631	1,111	0
1995	859	3,044	0	228	0	980	478	1,686	1,474	571	0
1996	1,100	4,279	20	814	0	5,995	417	7,246	1,077	373	18
1997	788	2,747	22	487	0	352	178	1,039	757	425	0
1998	636	1,371	19	863	0	3,482	8	4,372	319	207	0
Avg 1990-97	1,161	4,639	32	739	4	3,933	346	5,053	2,027	639	5
Avg 1993-97	991	3,764	33	536	0	3,055	257	3,880	1,818	610	4

Table 10.-Sport fish effort and harvests by species from the Pilgrim River 1983-1998, and catches 1990-1998.

Year	Number of Anglers	Days Fished	King Salmon	Coho Salmon	Red Salmon	Pink Salmon	Chum Salmon	All Salmon	Dolly Varden	Arctic Grayling	Northern Pike	Whitefish	Burbot
Harvests													
1983	0	597	0	37	0	37	111	185	445	761	148	0	0
1984	398	732	65	195	78	104	0	442	195	247	13	0	0
1985	363	375	10	20	20	50	100	200	14	319	0	0	0
1986	238	868	38	76	0	0	113	227	189	227	529	0	0
1987	438	1,159	72	109	435	0	272	888	163	272	199	0	0
1988	836	4,822	55	218	746	36	346	1,401	327	109	91	36	0
1989	1,050	1,678	68	204	78	301	272	923	603	516	415	131	10
1990	862	1,710	19	81	93	208	41	442	498	415	1,194	0	33
1991	1,169	3,183	51	310	124	81	85	651	1,015	459	608	13	0
1992	686	1,184	55	57	66	55	106	339	131	91	231	0	0
1993	570	1,195	28	191	10	0	0	229	730	75	207	0	0
1994	323	844	0	134	9	154	0	297	63	49	108	0	0
1995	531	1,253	19	113	62	0	73	267	74	52	68	18	11
1996	562	1,348	0	136	0	48	0	184	314	56	62	0	0
1997	458	825	45	0	20	0	0	65	65	81	117	0	0
1998	392	546	32	6	0	0	0	38	14	0	26	0	0
Avg 1988-97	705	1,804	34	144	121	88	92	480	382	190	310	20	5
Avg 1993-97	489	1,093	18	115	20	40	15	208	249	63	112	4	2
Catches													
1990	862	1,710	57	186	198	736	460	1,637	845	1,476	2,918	0	33
1991	1,169	3,183	65	476	374	406	194	1,515	3,155	4,463	1,499	13	0
1992	686	1,184	55	162	90	714	197	1,218	279	526	863	18	0
1993	570	1,195	92	325	106	392	254	1,169	3,038	2,362	959	0	11
1994	323	844	0	436	18	350	146	950	180	266	358	0	0
1995	531	1,253	19	472	163	58	232	944	294	370	656	27	11
1996	562	1,348	0	275	45	356	133	809	416	635	274	0	0
1997	458	825	89	49	115	0	14	267	254	428	262	0	0
1998	392	546	32	65	145	4,813	2,113	7,168	2,175	65	77	0	0
Avg 1990-97	645	1,443	47	298	139	377	204	1,064	1,058	1,316	974	7	7
Avg 1993-97	489	1,093	40	311	89	231	156	828	836	812	502	5	4

Table 11.-Sport fish effort and harvests by species from the Fish/Niukluk River 1983-1998, and catches 1990-1998.

Year	Number of Anglers	Days Fished	King Salmon	Coho Salmon	Red Salmon	Pink Salmon	Chum Salmon	All Salmon	Dolly Varden	Arctic Grayling	Northern Pike	Whitefish	Burbot
Harvests													
1983	0	1,999	0	1,355	0	631	371	2,357	2,208	5,160	557	0	0
1984	521	1,115	0	1,090	0	78	52	1,220	325	376	13	0	13
1985	466	889	0	40	0	70	10	120	195	945	0	0	35
1986	850	1,888	189	1,359	0	415	0	1,963	1,359	1,114	19	0	0
1987	809	2,473	36	1,032	0	127	72	1,267	1,376	2,119	471	0	0
1988	866	2,245	0	800	0	73	127	1,000	891	1,237	0	0	0
1989	641	2,124	0	728	0	233	107	1,068	734	808	0	70	0
1990	580	2,059	0	267	0	638	216	1,121	348	415	17	0	0
1991	881	2,524	14	977	0	356	272	1,619	1,474	1,320	283	13	35
1992	773	2,742	0	753	0	357	15	1,125	303	158	43	0	0
1993	832	3,962	9	1,185	0	278	514	1,986	1,003	619	75	9	21
1994	766	3,082	10	1,122	0	231	119	1,482	708	644	99	0	0
1995	918	2,603	18	818	0	136	27	999	368	430	0	37	34
1996	804	2,809	10	1,708	0	203	151	2,072	333	187	108	0	0
1997	726	3,052	71	461	0	58	0	590	2,069	734	30	130	148
1998	229	1,344	0	316	0	0	0	316	160	16	0	0	84
Avg 1988-97	779	2,720	13	882	0	256	155	1,306	823	655	66	26	24
Avg 1993-97	809	3,102	24	1,059	0	181	162	1,426	896	523	62	35	41
Catches													
1990	580	2,059	0	1,140	0	2,096	487	3,723	912	2,189	133	0	0
1991	881	2,524	22	1,417	0	579	521	2,539	3,439	7,261	764	39	35
1992	773	2,742	0	1,555	0	1,969	326	3,850	1,041	2,171	256	0	0
1993	832	3,962	9	1,804	0	909	945	3,667	6,130	5,976	75	44	21
1994	766	3,082	29	1,448	0	2,052	1,271	4,800	2,125	2,398	596	56	0
1995	918	2,603	18	1,401	0	300	428	2,147	662	1,169	137	65	34
1996	804	2,809	59	2,780	0	2,950	1,627	7,416	1,551	1,299	410	0	0
1997	726	3,052	125	1,749	105	1,204	711	3,183	9,939	10,429	422	314	276
1998	229	1,344	15	772	0	3,252	822	4,861	1,390	8,156	189	198	84
Avg 1990-97	785	2,854	33	1,662	13	1,507	790	3,916	3,225	4,112	349	65	46
Avg 1993-97	809	3,102	48	1,836	21	1,483	996	4,243	4,081	4,254	328	96	66

Table 12.-Sport fish effort and harvests by species from the Snake River 1983-1998, and catches 1990-1998.

Year	Number of Anglers	Days Fished	King Salmon	Coho Salmon	Red Salmon	Pink Salmon	Chum Salmon	All Salmon	Dolly Varden	Arctic Grayling	Whitefish
Harvests											
1983	0	119	19	0	0	37	0	56	223	278	0
1984	245	418	0	273	0	143	0	416	65	26	0
1985	129	361	0	120	0	0	0	120	0	139	0
1986	136	850	0	94	0	378	94	566	57	378	0
1987	nd ^a	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1988	340	2,128	0	800	0	546	437	1,783	218	709	0
1989	148	436	0	10	0	291	97	398	44	101	0
1990	298	775	10	47	0	111	41	209	66	116	0
1991	647	2,384	7	798	62	71	93	1,031	1,252	402	0
1992	461	2,379	8	510	0	183	0	701	115	16	0
1993	622	1,468	9	248	0	151	0	408	331	467	0
1994	341	880	0	145	0	452	7	604	117	32	0
1995	640	1,968	0	85	0	19	0	104	131	18	9
1996	470	1,686	0	447	0	644	0	1,091	81	94	18
1997	236	447	0	98	0	0	0	98	81	0	0
1998	164	376	0	0	0	463	0	765	0	8	0
Avg 1988-97	420	1,455	3	319	6	247	68	643	244	196	3
Avg 1993-97	462	1,290	2	205	0	253	1	461	148	122	5
Catches											
1990	298	775	29	58	0	222	122	431	315	199	0
1991	647	2,384	14	1,798	73	234	109	2,228	3,471	2,096	0
1992	461	2,379	8	640	0	1,182	0	1,830	180	158	0
1993	622	1,468	9	306	0	429	37	781	1,003	1,614	0
1994	341	880	60	235	0	648	37	980	420	377	0
1995	640	1,968	0	245	0	300	189	734	507	887	9
1996	470	1,686	0	556	0	943	113	1,612	213	813	27
1997	236	447	0	117	0	0	9	228	243	121	135
1998	164	376	0	64	0	463	0	527	0	218	0
Avg 1990-97	464	1,498	15	494	9	495	77	1,103	794	783	21
Avg 1993-97	462	1,290	14	292	0	464	77	867	477	762	34

nd = No data.

its proximity to Nome and ease of access to visitors and residents alike. Salmon harvests from the Nome River increased 10 fold between 1997 and 1998, reflecting the strong even-year pink salmon run in spite of reduced amount of angler effort. Effort on the Nome River has dropped continuously from a high of 7,200 angler days in 1990 to about 1,370 angler days in 1998. The pink salmon harvest of about 1,985 fish in 1998 may also have been influenced by reduced subsistence opportunity on depressed chum salmon stocks that likely served to focus local sport fishing effort on the abundant pink salmon. The 1998 harvest of coho salmon in the Nome River was about 190 fish, about half the recent five-year average harvest of about 400 fish (Table 9). Chum salmon fishing is closed and harvests of sockeye and chinook salmon in the Nome River are negligible. A similar declining trend in sport fishing effort has been seen in the Fish/Niukluk River system from a high of about 4,000 angler days in 1993 to 1,344 angler days in 1998 (Table 11). Although sport fishing for chum salmon is allowed in this drainage, harvests of all salmon species except coho were negligible in 1998. The coho harvest in 1998 was about 300 fish from an estimated catch of 613. The negligible harvest of pink salmon in 1998 occurred in spite of an abundant run of this species with over 1,500,000 counted through the tower, and probably over 2,000,000 fish present in the river. The Pilgrim River is the other road accessible water where chum salmon fishing is still allowed. Effort there dropped to 546 angler days in 1998 from a recent five-year average of 1,100 angler days (Table 10). Effort in this system appears to target chinook and 32 were estimated to have been harvested in 1998. Recent harvests of other salmon species have been negligible.

Sport Fishery Management Objectives

There have been no specific management objectives identified for salmon fisheries on the in Nome roadside streams. The goal of sport fishery management in the in these waters is to maintain opportunity for anglers to participate in the fisheries and to assure that escapement goals are met. Sport fishery harvests are small, and emergency actions to restrict harvest are generally not contemplated unless escapement monitoring projects indicate that the a particular run is small and that restrictions in subsistence fisheries may be necessary. Biological Escapement Goals (BEG's) based on tower estimates (Snake and Pilgrim rivers), and weir counts (Nome River) are being developed, but will not be established until more years of reliable data have been accumulated. When BEG's are in place, more precise management to attain those goals will become possible.

Recent Board of Fisheries and Management Actions

Chum salmon stocks in the Nome area are depressed, and an effort to restore these runs is ongoing. Salmon sport fisheries in northwestern Alaska are managed in cooperation with the Division of Commercial Fisheries. Subsistence uses are given priority. Since the availability of salmon resources is limited and local chum salmon populations are depressed, particularly in the Nome area where sport fishing effort is greatest, the Nome area has most often required restrictive management measures.

In 1984 the BOF reduced the bag and possession limits in the Nome and Snake rivers to 15 salmon other than king salmon, only 5 of which could be chum and coho in combination, and in 1985 all but the lower 2 miles of the Nome River was closed to all sport fishing for salmon by emergency order.

In 1987, additional regulations were adopted in Seward Peninsula drainages (Cape Prince of Wales to Cape Darby) which reduced the bag and possession limit for salmon other than chinook

Table 13.-Sport fish effort and harvests by species from the Solomon River 1983-1998, and catches 1990-1998.

Year	Number of Anglers	Days Fished	King Salmon	Coho Salmon	Red Salmon	Pink Salmon	Chum Salmon	All Salmon	Dolly Varden	Arctic Grayling	Whitefish
Harvests											
1983	0	30	0	0	0	0	0	0	37	0	0
1984	215	766	0	299	0	0	0	299	221	0	0
1985	391	2,667	0	80	0	120	219	419	611	0	0
1986	102	102	0	0	0	38	0	38	0	0	0
1987	270	272	0	109	0	0	72	181	1,576	91	0
1988	155	309	0	18	0	0	0	18	36	127	0
1989	263	492	10	136	0	243	49	438	745	152	0
1990	216	458	0	12	0	361	14	387	182	17	0
1991	593	1,057	7	83	0	173	0	263	2,219	158	0
1992	685	962	0	316	0	210	0	526	131	0	0
1993	317	1,404	28	420	0	259	0	707	893	0	61
1994	328	1,193	0	235	0	256	0	491	269	0	19
1995	426	781	0	38	0	87	0	125	366	0	0
1996	278	572	0	169	0	0	0	169	41	0	0
1997	251	435	0	10	0	15	0	25	184	0	25
1998	245	340	0	0	16	154	0	170	383	0	0
Avg 1988-97	351	766	5	144	0	160	6	315	507	45	11
Avg 1993-97	320	877	6	174	0	123	0	303	351	0	21
Catches											
1990	216	458	0	12	58	736	108	914	415	33	0
1991	593	1057	7	83	0	620	47	757	4549	602	0
1992	685	962	0	316	0	998	91	1405	197	38	0
1993	317	1404	47	650	0	633	0	1330	1725	140	61
1994	328	1193	0	255	0	784	7	1046	520	212	19
1995	426	781	0	208	0	190	22	420	734	200	0
1996	278	572	0	268	0	39	0	307	41	74	0
1997	251	435	0	39	0	73	0	112	414	701	25
1998	245	340	17	59	64	433	0	573	410	0	0
Avg 1990-97	387	858	7	229	7	509	34	786	1,074	250	13
Avg 1993-97	320	877	9	284	0	344	6	643	687	265	21

Table 14.-Sport fish effort and harvests by species from the Kuzitrin River 1983-1998, and catches 1990-1998.

Year	Number of Anglers	Days Fished	King Salmon	Coho Salmon	Red Salmon	Pink Salmon	Chum Salmon	All Salmon	Dolly Varden	Arctic Grayling	Northern Pike	Whitefish	Burbot
Harvests													
1983	0	179	0	0	0	0	0	0	0	371	0	0	0
1984	153	279	0	0	0	325	0	325	260	195	156	0	0
1985	103	84	0	0	0	0	0	0	0	195	14	0	0
1986	204	318	0	0	0	0	0	0	38	189	151	0	0
1987	135	1,392	0	0	0	0	0	0	91	181	127	0	0
1988	217	1,037	0	0	36	55	54	145	109	1,255	437	36	0
1989	115	313	0	0	0	0	0	0	0	283	233	0	0
1990	282	572	0	0	0	28	14	42	0	133	746	0	0
1991	414	836	0	0	10	10	0	20	222	286	481	0	0
1992	287	469	0	8	0	46	0	54	8	0	128	0	0
1993	293	463	0	0	0	0	0	0	146	101	209	0	0
1994	267	643	0	109	0	0	0	109	0	98	169	0	0
1995	214	413	0	0	0	0	40	40	22	44	137	0	0
1996	293	675	0	0	0	38	0	38	71	243	240	0	0
1997	237	443	0	0	0	0	0	0	0	108	215	0	0
1998	122	122	0	0	0	0	0	0	0	0	38	0	0
Avg 1988-97	262	586	0	12	5	18	11	45	58	255	300	4	0
Avg 1993-97	261	527	0	22	0	8	8	37	48	119	194	0	0
Catches													
1990	282	572	0	0	0	194	27	221	0	298	1,094	0	0
1991	414	836	0	0	10	41	0	51	333	1,349	1,937	0	0
1992	287	469	0	89	0	82	0	171	8	481	1,956	37	0
1993	293	463	0	0	0	0	0	0	263	288	751	9	0
1994	267	643	0	109	0	16	0	125	0	351	722	0	0
1995	214	413	0	0	0	0	40	40	54	192	1,005	0	11
1996	293	675	0	0	0	48	11	59	71	299	1,063	0	0
1997	237	443	0	0	63	0	0	63	84	0	1,492	0	0
1998	122	122	0	0	0	0	0	0	8	0	38	0	0
Avg 1990-97	286	564	0	25	9	48	10	91	102	407	1,253	6	1
Avg 1993-97	261	527	0	22	13	13	10	57	94	226	1,007	2	2

Table 15.-Sport fish effort and harvests by species from the Penny River 1983-1998, and catches 1990-1998.

Year	Number of Anglers	Days Fished	King Salmon	Coho Salmon	Red Salmon	Pink Salmon	Chum Salmon	All Salmon	Dolly Varden	Arctic Grayling
Harvests										
1983	nd ^a	nd	nd	nd	nd	nd	nd	nd	nd	nd
1984	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1985	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1986	306	396	0	113	0	396	189	698	189	189
1987	34	34	0	0	0	0	0	0	0	0
1988	31	91	0	73	0	0	0	73	73	0
1989	33	34	0	10	0	0	0	10	99	30
1990	66	343	0	35	0	416	0	451	0	0
1991	36	61	0	0	0	0	0	0	95	0
1992	37	37	0	16	0	0	0	16	0	0
1993	Nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1994	78	101	0	0	9	34	0	43	46	0
1995	42	43	0	0	0	0	0	0	0	0
1996	44	103	0	99	0	0	0	99	10	0
1997	15	15	0	0	0	0	0	0	0	0
1998	Nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Avg 88-97	42	92	0	26	1	50	0	77	36	3
Avg 93-97	45	66	0	25	2	9	0	36	14	0
Catches										
1990	66	343	0	35	0	416	0	451	0	0
1991	36	61	0	0	0	0	0	0	95	0
1992	37	37	0	16	0	0	0	16	0	0
1993	Nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1994	78	101	0	20	87	341	0	448	84	0
1995	42	43	0	0	0	0	0	0	0	0
1996	44	103	0	99	0	0	0	99	51	56
1997	15	15	0	0	0	0	0	0	0	20
1998	Nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Avg 90-97	45	100	0	24	12	108	0	145	33	11
Avg 93-97	45	66	0	30	22	85	0	137	34	19

nd = no data

Table 16.-Sport fish effort and harvests by species from the Cripple River 1983-1998, and catches 1990-1998.

Year	Number of Anglers	Days Fished	King Salmon	Coho Salmon	Red Salmon	Pink Salmon	Chum Salmon	All Salmon	Dolly Varden	Arctic Grayling
Harvests										
1983	0	179	0	37	0	93	0	130	111	0
1984	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1985	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1986	102	170	0	113	0	189	189	491	57	0
1987	101	181	0	0	0	0	0	0	0	0
1988	155	509	0	528	0	0	0	528	127	127
1989	66	257	0	78	0	165	39	282	0	0
1990	66	813	0	140	0	1,138	41	1,319	663	0
1991	108	221	0	24	0	0	0	24	0	0
1992	37	149	0	32	0	92	0	124	0	0
1993	125	1,121	0	57	0	212	0	269	0	0
1994	91	320	0	122	0	85	0	207	27	0
1995	78	272	0	10	0	84	0	94	38	0
1996	173	401	0	139	0	149	0	288	20	0
1997	79	206	0	12	0	11	0	23	0	0
1998	513	2,303	0	366	0	1,141	0	1,507	272	0
Avg 88-97	98	427	0	114	0	194	8	316	88	13
Avg 93-97	109	464	0	68	0	108	0	176	17	0
Catches										
1990	66	813	0	314	0	2,665	162	3,141	1,492	0
1991	108	221	0	24	0	0	0	24	0	0
1992	37	149	0	49	0	1,053	0	1,102	0	0
1993	125	1,121	0	57	0	403	0	460	44	0
1994	91	320	0	268	0	426	0	694	27	0
1995	78	272	0	10	0	225	22	257	38	0
1996	173	401	0	229	0	416	266	911	88	0
1997	79	206	0	12	0	22	258	292	0	28
1998	513	2,303	0	4,178	0	6,808	1,331	12,317	570	52
Avg 90-97	95	438	0	120	0	651	89	860	211	4
Avg 93-97	109	464	0	115	0	298	109	523	39	6

nd = no data

Table 17.-Sport fish effort and harvests by species from the Sinuk River 1983-1998, and catches 1990-1998.

Year	Number of Anglers	Days Fished	King Salmon	Coho Salmon	Red Salmon	Pink Salmon	Chum Salmon	All Salmon	Dolly Varden	Arctic Grayling	Whitefish
Harvest											
1983	0	477	0	0	0	0	19	19	1,132	130	0
1984	306	366	0	234	26	1,272	143	1,675	844	428	0
1985	311	806	0	10	0	120	0	130	292	0	0
1986	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1987	405	5,198	0	0	380	91	72	543	652	724	0
1988	464	1,055	73	91	0	946	146	1,256	146	73	0
1989	230	906	0	10	0	0	10	20	175	51	104
1990	116	343	0	12	0	0	14	26	17	0	0
1991	557	885	0	71	41	51	47	210	729	129	0
1992	436	1,504	0	40	0	293	0	333	139	0	0
1993	463	874	9	96	0	115	0	220	536	37	0
1994	463	1,132	0	109	0	145	0	254	305	8	0
1995	485	1,295	0	19	21	28	0	68	158	18	0
1996	433	822	0	199	11	278	0	488	381	68	0
1997	247	570	0	0	0	55	0	55	378	0	0
1998	75	123	0	0	0	0	0	0	311	8	0
Avg 88-97	389	939	8	65	7	191	22	293	296	38	10
Avg 93-97	418	939	2	85	6	124	0	217	352	26	0
Catches											
1990	116	343	0	12	0	0	406	418	66	232	0
1991	557	885	0	167	41	224	186	618	2,584	1,291	0
1992	436	1,504	0	65	0	1,429	15	1,509	770	300	0
1993	463	874	9	143	10	547	28	737	1,179	879	0
1994	463	1,132	0	172	0	348	22	542	830	417	0
1995	485	1,295	0	113	66	125	44	348	723	498	9
1996	433	822	0	258	11	720	203	1,192	492	255	0
1997	247	570	0	218	12	77	145	452	1,315	1,276	0
1998	75	123	0	0	0	0	0	0	311	25	0
Avg 90-97	400	928	1	144	18	434	131	727	995	644	1
Avg 93-97	418	939	2	181	20	363	88	654	908	665	2

nd = no data

to 10 per day, 10 in possession, only 3 of which could be chum or coho salmon in combination. The limit for chinook salmon was set at 1 per day and in possession.

The Nome River was closed in July 1990 to the taking of chum salmon on sport fishing gear, and the following year, another emergency order closed Nome area waters to the retention of both chum and pink salmon. The area affected by this action was more widespread than in previous years and included all waters from the Sinuk River in the west to the Solomon River in the east.

Due to continued low escapements of chum salmon in Nome area streams, a proposal to close sport fishing for chum salmon in the rivers addressed in the 1991 emergency order was brought before the BOF and enacted into regulation. This regulation is intended to protect chum salmon stocks and will remain in effect until stocks recover and surpluses above the escapement goals are available for harvest by sport anglers.

Two emergency orders were issued addressing salmon in the Nome area in 1992. The first closed the Tubutulik and Kwiniuk rivers to sport fishing for chum salmon. The second, because of near record pink salmon runs, increased the bag and possession limits for pink salmon from 10 per day to 20 per day in Nome area streams.

During the December 1997 meeting the BOF adopted two salmon regulation changes for the NWMA. The first established a uniform daily bag and possession limit for chinook salmon in the entire NWMA at one fish. This replaced a three fish (only one over 28") daily bag and possession except for the Unalakleet River where a one fish limit was already in place. Since the Unalakleet River has the strongest chinook run in the NWMA, having a more liberal limit in other parts of the area where chinook runs were small made little sense. The other change was for northern Norton Sound which includes the streams accessible from the Nome road system. The "other salmon" aggregate limit of 10 fish per day only 3 of which could be chum or coho was split out to provide separate daily bag and possession limits by species. The new limits were set at 10 pink, 3 coho, 3 chum, and 3 sockeye. The new regulation will provide for more precise management by species, and is less ambiguous for the inexperienced angler. Nome subdistrict streams still remain closed to fishing for chum salmon.

Because of weak coho runs throughout northern Norton Sound, an emergency order was issued on August 15, 1997 that mandated the release of all coho caught while sport fishing in northern Norton Sound waters, in addition, bait was eliminated as a legal gear while fishing for coho. This action remained in effect until September 30, 1997.

The BOF scheduled a special meeting in Nome for March 1998 to discuss the chum salmon situation in the Nome subdistrict. The BOF directed Nome area residents to create a Subsistence Salmon Working Group to address the issue of the chronic chum salmon shortage and consider the possibility of Tier-II management. The group did not recommend Tier-II management, however in the March 1999 meeting, the BOF directed the department to implement Tier II subsistence management for chum salmon in the Nome subdistrict.

Current Issues

Chum salmon stocks have steadily declined on the Seward Peninsula since the early 1980's, as evidenced by failure to achieve desired spawning escapements in many key streams where spawners are enumerated. This has created the need for increasingly restrictive sport, commercial and even subsistence fishing regulations. It is anticipated that until chum salmon populations recover, there will be a need to continue with very restrictive measures to protect

local stocks. All rivers in northern Norton Sound from the Sinuk in the west to Topkok in the west are closed to fishing for chum salmon, and will remain closed until runs rebuild. In addition, restrictions to the sport harvest of coho salmon in the Nome area have been necessary during recent years. Increased effort is being directed at the enumeration of coho salmon escapements in Nome area streams through the cooperative funding of counting tower projects.

Ongoing Research and Management Activities

Current research and management activities on Nome roadside salmon populations are primarily conducted by the CFMD in conjunction with Kawarek Corporation's fisheries office. These groups cooperatively staff and manage escapement enumeration projects on the Niukluk, Eldorado, Pilgrim and Snake rivers. All projects are counting towers except the Nome River where a weir is run by CFMD throughout the salmon runs. The weir obstructs the movement of all fish, and fish are counted as they are permitted to pass through an opening in the weir several times each day. In addition, the BLM has operated a weir on the Pilgrim River to enumerate sockeye migrating into Salmon Lake during some years.

NORTHWESTERN ALASKA DOLLY VARDEN AND ARCTIC CHAR

Fishery Description and Historical Perspective

In the Northwestern Management Area, Arctic char occur in lakes in the Kigluaik Mountains and in some headwater lakes in the Kobuk and Noatak river drainages, while Dolly Varden are common inhabitants of most coastal streams and large rivers (Figure 12). Although the department groups Dolly Varden and Arctic char for bag limits and record keeping, the two species are separate. Arctic char distribution is very limited in the NWMA and the vast majority of char fisheries are directed toward Dolly Varden.

Many northwestern Alaska residents maintain a traditional lifestyle, and are dependent to some degree on locally harvested fish resources. Dolly Varden comprise an important part of this traditional harvest, and in Kivalina they outrank salmon and whitefish in importance to the subsistence economy. The number of Dolly Varden harvested for subsistence purposes in northwestern Alaska vastly exceeds the number taken by sport anglers. Intermittent community subsistence harvest estimates dating to 1959 for Kivalina and Noatak (Table 18) and personal observation of the area biologist suggest that 15,000 to 25,000 Dolly Varden are harvested annually in this area. The actual magnitude of the annual harvests throughout the NWMA are not known. Fish are captured with gill nets or beach seines during open water periods, and with gill nets or with hook and line during winter. Dolly Varden are also an important subsistence resource in Norton Sound, however their relative importance is minor compared to salmon.

Estimated harvests of Dolly Varden by sport anglers in the Seward Peninsula/Norton Sound sub-area have averaged about 5,000 fish over the past 20 years (Table 19). Observations and aerial surveys suggest that Dolly Varden spawner abundance is low in most rivers, however, spawning occurs in almost all drainages of Norton Sound, some northern Seward Peninsula rivers, and the major drainages of Kotzebue Sound and the Chukchi Sea. Aerial surveys of spawning Dolly Varden conducted during the mid 1980's indicated that about 12,000-15,000 spawn annually in the Noatak drainage (Table 20). Total abundance of spawning Dolly Varden in northwestern Alaska is unknown, however, recent surveys suggest that spawner abundance is similar to earlier observations.

Drainages of Kotzebue Sound and the Chukchi Sea are known for the large size of anadromous Dolly Varden available to the sport angler. Since the inception of ADF&G's Trophy Fish

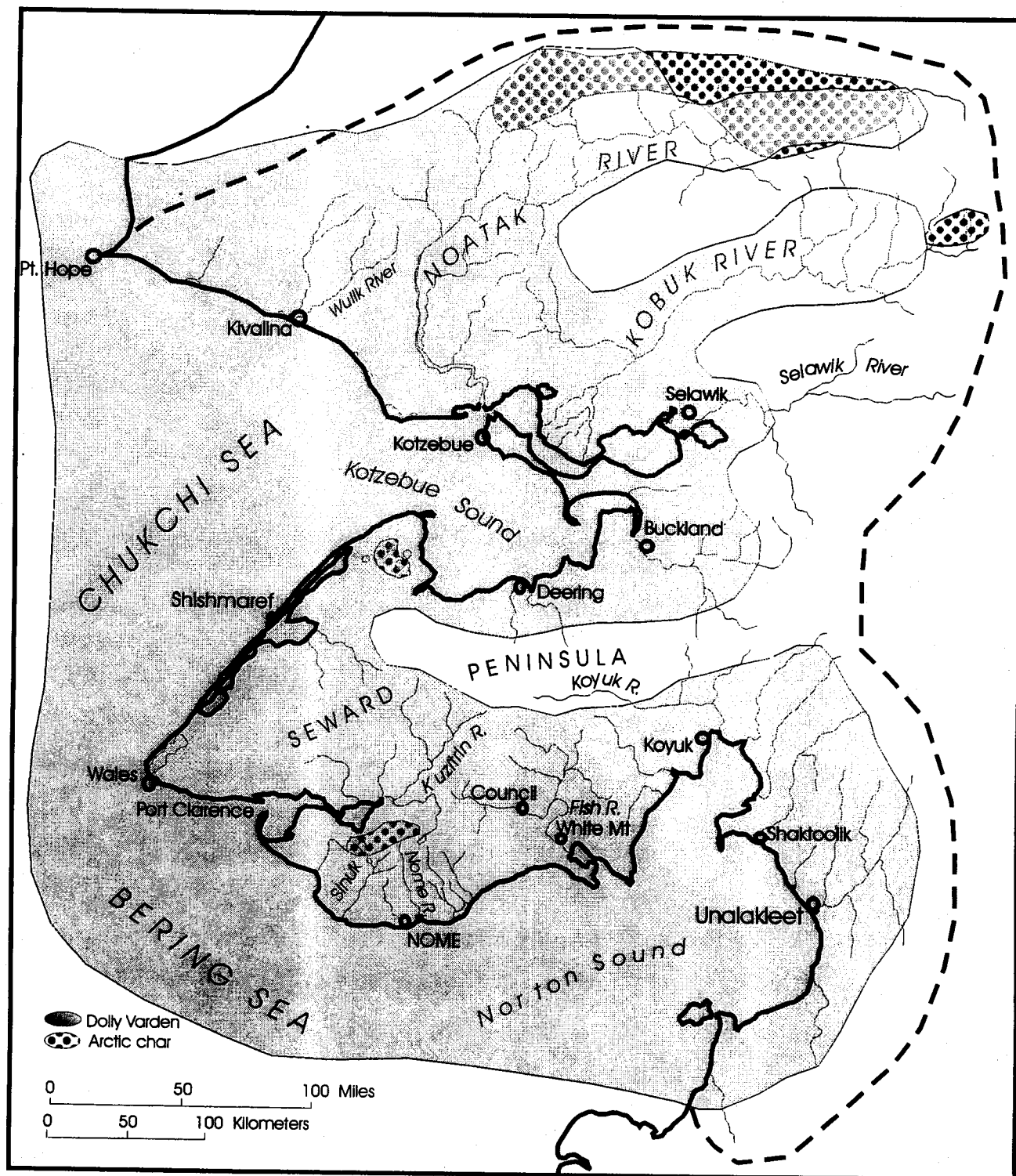


Figure 12.-Dolly Varden and Arctic char distribution in the NWMA.

Table 18.-Documented subsistence harvests of Dolly Varden in Noatak and Kivalina rivers.

Year	Kivalina		Noatak Number
	Number	Pounds	
1959	34,240	85,600 ^a	
1960	49,720	124,300 ^a	
1962			27,623 ^b
1963			4,130
1964		93,995	
1965		28,140	
1968	49,512	120,214	
1969	64,970	152,750	32,350
1970	33,820	79,420	3,700
1971	29,281	68,518	5,320
1972	48,807	114,637	1,492
1979 ^c	14,600		
1980			9,060
1981 ^c	15-18,000		7,220
1982 ^c	18,438	69,059	3,056
1983 ^c	16,270	68,467	2,676
1984 ^c	12,000		4,545
1985 ^c	10,500		2,542
1986 ^c	7,436		
1991			4,814 ^d
1992			4,395 ^d
1993			4,275 ^d
1995			5,762 ^d
1996			5,031 ^d
1997			4,763 ^d
1998			3,872 ^d

^a Sarrio and Kessel 1966

^b Foote and Williamson 1966

^c Data from Sport Fish Division surveys.

^d Data from ADF&G Subsistence Division household surveys Georgette and Utermohle 1998.

Table 19.-Historic Dolly Varden harvests and catches in NWMA by sub-area 1977 – 1998.

Year	Seward Peninsula/Norton Sound					Kotzebue/Chukchi Sea				
	Number of Anglers	Effort Angler Days	Dolly Varden Harvest	Dolly Varden Catch	Percent Harvest	Number of Anglers	Effort Angler Days	Dolly Varden Harvest	Dolly Varden Catch	Percent Harvest
1977		7,828	1,621				3,487	469		
1978		8,379	1,690				4,997	199		
1979		8,725					2,593	1,772		
1980		7,958	5,811				3,841	301		
1981		10,879	3,981				5,284	1,177		
1982		13,198	6,498				6,906	1,531		
1983		16,944	9,779				7,963	2,192		
1984	1,597	17,436	4,260			696	7,791	3,804		
1985	2,854	19,919	5,695			1,788	6,701	1,557		
1986	2,872	18,107	5,381			1,570	6,313	1,300		
1987	2,528	20,413	5,506			2,090	9,288	1,072		
1988	2,661	20,278	4,437			959	5,279	983		
1989	2,560	17,692	7,003			1,028	4,932	999		
1990	2,686	21,799	3,765	9,118	41	991	3,782	806	3,747	22
1991	3,236	23,622	10,365	25,425	41	1,606	9,543	1,149	1,658	69
1992	3,540	22,684	2,382	6,012	40	1,421	6,145	582	7,054	8
1993	3,134	18,930	5,907	22,166	27	1,575	7,809	914	7,190	13
1994	3,016	18,922	3,071	7,344	42	1,100	6,036	2,365	10,733	22
1995	3,719	19,647	2,908	7,921	37	1,957	8,495	939	7,804	12
1996	3,308	18,637	3,672	7,150	51	1,501	7,763	528	3,075	17
1997	2,936	15,520	2,711	8,968	30	864	4,772	480	3,782	13
1998	3,206	13,616	2,240	5,711	39	1,089	3,801	440	8,606	5
Avg (88-97)	3,016	19,688	4,759	11,763	39	1,389	6,680	1,010	5,630	22
Avg (93-97)	3,223	18,331	3,654	10,710	34	1,399	6,975	1,045	6,517	16

Table 20.-Aerial counts of Dolly Varden spawning in the Noatak River and overwintering in the Wulik and Kivalina rivers 1968-1998. ^a

Year	Spawners	Nonspawners	
	Noatak River	Wulik River	Kivalina River
1968		90,286 ^b	27,640
1969		297,257 ^b	
1976		68,300 ^b	12,600
1979		55,030	15,744
1980		113,553	39,692
1981	7,922	101,826	45,355
1982	8,275	65,581	10,932
1984	9,290	30,923	5,474
1985	11,073		
1986		5,590	5,030
1988		80,000	
1989		56,384	
1990	7,261		
1991	9,605	126,985	35,275
1992		135,135	
1993	9,560	144,138	16,534
1994		66,752	
1995	6,500	128,705	28,870
1996	12,184	61,005	
1997		95,412	
1998		104,043	

^a Sport Fish Division aerial surveys

^b CFMD aerial surveys

Program in 1967, out of 166 qualifying fish in the Dolly Varden/Arctic char category, 90 (54%) have come from the NWMA, and in the past 10 years (1987-1996) 73 out of 93 (78%) have come from northwestern Alaska. In addition, the current Alaska sport fish angling record for Arctic char/Dolly Varden (19 lbs. 12 oz.) is a Dolly Varden taken from the Noatak River in 1991.

During summer, spawning Dolly Varden are targeted in some northwestern Alaskan streams, however, most sport fisheries for char target overwintering populations of Dolly Varden either in the fall as they enter freshwater from the sea, or in the spring as they move toward the sea for feeding. Since overwintering populations are comprised of mixed stocks, potentially from a wide geographic area, harvests in the few rivers with good angler access have been sustainable. In some streams along the Nome road system, if such harvests were directed towards a single stock they would likely not be sustainable. Movements of Norton Sound Dolly Varden are tied to those of salmon, and Dolly Varden are present in streams during late summer to feed on salmon eggs, especially during years of high pink salmon abundance. They are likely to remain in streams during the spring following a large pink salmon run in order to feed on outmigrating fry. The timing of the fall movement of Dolly Varden into Seward Peninsula streams has varied widely over the past 10 years resulting in annual changes in the availability of Dolly Varden to the fall fishery. Consequently, fisheries in this area follow these patterns of availability. In 1988, the BOF adopted the bag limit of 10 Dolly Varden/Arctic char per day with 10 in possession with exceptions for the Noatak, Wulik, and Kivalina rivers where only 2 of the 10 fish could be over 20 inches in length. In 1994, the BOF adopted the current daily bag and possession limits for char in the AYK region with 10 fish per day, only 2 over 20 inches allowed in marine or flowing waters; and 2 fish per day allowed in lakes. Due to habitat preferences, these regulations allow a liberal limit for Dolly Varden while protecting spawning fish, and a conservative limit for Arctic char without the need for anglers to differentiate the two species.

Recent Fishery Performance

In the Kotzebue/Chukchi Sea sub-area, sport harvests have averaged 1,200 Dolly Varden annually. During the past five years, the harvests have averaged 3,650 and 1,050 respectively. Estimated mean annual catch (which includes fish that are kept and those released) since 1990 has been 10,700 Dolly Varden in the Seward Peninsula/Norton Sound area, and 6,500 in the Kotzebue/Chukchi Sea area (Table 19). The data suggest that about 65% of all Dolly Varden captured in the Seward Peninsula/Norton Sound area are released while about 84% in the Kotzebue area are released. The higher harvest rate in the Seward Peninsula/Norton Sound area is likely because local residents have good road access to fishing areas where fish taken on rod and reel are used for food. In the Kotzebue area, fishing sites are accessed by air and much of the effort is from outside the local area by anglers seeking a quality fishing experience. While effort levels in both the Seward Peninsula/Norton Sound area and the Kotzebue area were lower in 1997 and 1998, the catches of Dolly Varden were up from 1996. The catch of Dolly Varden per angler day has averaged much higher in the Kotzebue area than in the Seward Peninsula area. This is likely because much of the effort on the Seward Peninsula is directed at other species, while most of the Kotzebue area effort is directed at Dolly Varden. The Kotzebue area seems to be attracting more visiting anglers seeking to catch large northern form Dolly Varden.

Dolly Varden harvests in the Seward Peninsula/Norton Sound sub-area are distributed among most of the sampled rivers with highest harvests coming from the Nome, Unalakleet, Solomon

and Fish/Niukluk rivers (Table 21). In the Kotzebue/Chukchi Sea sub-area, highest harvests are from the Noatak and the “other rivers” category which includes the Wulik and Kivalina rivers.

Wulik River

The Wulik River is located about 90 miles north of Kotzebue and is well known as a “char” destination. The river is about 90 miles long and enters the Chukchi Sea through Kivalina Lagoon near the village of Kivalina. The river is heavily used by the residents of Kivalina for subsistence and the majority of the village harvest of Dolly Varden comes from the Wulik River (Table 18). During the most recent five-year period (1994-1998), estimated sport fishing effort has averaged about 500 angler-days (Howe et al. 1995-1999). Sport fishing occurs throughout the open water period, but the majority of effort and harvest occurs during late August and September when Dolly Varden return from the sea to winter in the river.

The estimated sport harvest of Dolly Varden from the Wulik River during 1997 and 1998 was 251 and 200 fish respectively (Howe et al. 1998, 1999). Catches for the same period were estimated at 3,594 and 5,132 Dolly Varden. Approximately 60% of the catch was of fish greater than 20 inches in length. Although the river is well known for its large run of anadromous Dolly Varden, effort remains low because of the river’s remote location and difficulty of access.

Fishery Objectives and Management

Management of Dolly Varden in Norton Sound streams is structured to maintain opportunity and allow a relatively liberal bag on mixed stock population aggregations. In the Kotzebue sub-area, the intent is to maintain a high quality fishery with the opportunity to harvest a small number of large sized char under a conservative bag that protects the spawning component of the population and minimizes conflicts with subsistence users. Because of the differential size structure of the population groups north and south of the Bering Strait, these objectives can be addressed with the same general bag and possession limit regulation of 10 fish per day with only 2 over 20 inches in length.

Fishery Outlook

Dolly Varden in Norton Sound are widespread, they spawn in most rivers and overwinter in all major drainages. The outlook is for fisheries to continue into the future without further management actions unless the participation in the fisheries changes dramatically. In the Kotzebue area, the fishery is likely to grow in popularity as more anglers experience these high quality fishing opportunities. Until these fisheries grow to the point that harvests are thought to affect spawner abundance or spawner success, it is unlikely that additional management actions will be necessary.

Recent Board of Fisheries and Management Actions

Population assessments conducted on the Nome and Solomon rivers in 1991 and 1992 suggested that the number of fish overwintering in these drainages could not sustain harvest levels. Consequently, the daily bag limit was reduced by emergency order to 2 fish. Subsequent studies showed that these populations were comprised of mixed stocks and that at least 20% of the fish overwintering in a given river could be expected to overwinter in another river the next year.

Table 21.-Historic Dolly Varden sport fish harvests in the NWMA by sub-area and rivers (1988-1998).

Areas	Year												Average	Average
	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1988-97	1993-97
Seward Peninsula/Norton Sound Dolly Varden Harvests														
Salt Water	0	418	55	183	0	204	205	90	0	10	160	0	133	93
Nome River		2,001	3,551	1,078	1,220	557	917	431	462	715	291	302	1,122	563
Pilgrim River		327	603	166	856	131	448	63	74	314	58	14	304	191
Unalakleet R.		891	570	614	1,474	746	427	410	976	1,301	762	588	817	775
Fish-Niukluk R.		0	734	348	1,474	270	1,003	699	346	333	514	160	572	579
Sinuk R.					729	139	536	305	158	381		311	375	345
Snake R.					1,252	115	331	117	131	81	69	0	299	146
Solomon R.					2,219	131	893	197	366		175	383	664	408
Other Streams	5,506	1,218	1,545	1,227	1,141	89	1,050	759	395	537	682	482	864	685
Lakes		0	0	332	0	0	97	0	0	0	0		43	19
Freshwater Total	5,506	4,437	7,003	3,765	10,365	2,178	5,702	2,981	2,908	3,662	2,551	2,240	4,555	3,561
Grand Total	5,506	4,855	7,058	3,948	10,365	2,382	5,907	3,071	2,908	3,672	2,711	2,240	4,688	3,654
Kotzebue/Chukchi Sea Harvests														
Salt Water	148	0	0	0	199	0	0	27	22	0	22	0	27	14
Kobuk R.	127		23	34	170	99	9	132	28	101	11	49	67	56
Noatak R.	844		651	386	936	197	325	786	124	121	103	159	403	292
Other Streams	401	965	302	302	412	279	533	1,402	676	296	458	232	563	673
Lakes	0	18	23	471	0	107	47	18	0	10	0	0	69	15
Freshwater Total	1,372	983	999	1,193	1,518	682	914	2,338	828	528	572	440	1,056	1,036
Grand Total	1,520	983	999	1,193	1,717	682	914	2,365	850	528	594	440	1,083	1,050

Tag recoveries showed that fish range over a wide geographic area. Since exploitation occurs primarily on mixed stocks in only a few locations and many of the represented stocks sustain no other exploitation, harvest levels were thought to be sustainable. Long-term harvest data supported this assumption and the reduced bag limit was rescinded. In the November 1994 meeting, the BOF adopted regulations that created a 10 fish with only 2 over 20 inches daily bag and possession limit for Dolly Varden/Arctic char in flowing and marine waters for the entire AYK Region. A separate daily bag limit of 2 fish (no size limit) was also created for lakes. The effects of these new bag limits are to have a fairly liberal limit for resident and migratory Dolly Varden that protects spawning sized fish, while maintaining a conservative limit for lake resident Arctic char without requiring anglers to differentiate between the two species. This bag limit has not needed to be adjusted, and no recent emergency orders have been issued regarding char in NWMA.

Current Issues

With over 100,000 anadromous Dolly Varden overwintering annually, the Wulik River is probably the most important Dolly Varden stream in northwestern Alaska (Table 20). Fish from this river are also very important as a subsistence food to the residents of Kivalina who harvest 15,000 to 20,000 annually (Table 18). The Red Dog Mine is located in the headwaters of this drainage and poses a potential threat to these fish and the water quality of the river. Water quality near the mine is systematically monitored and except for a pollution event in 1989-1990, the mine has operated in an environmentally sensitive manner. The Red Dog Mine funds a program run by the Division of Habitat to monitor heavy metals concentrations in receiving waters and in fish tissues. Fish are sampled in the spring and the fall each year on a continuing basis in cooperation with the Division of Habitat. A recent development has been the identification of selenium in high concentration. Potential effects and treatment methods are currently being researched by the Division of Habitat and mine personnel.

The question of how great an impact Dolly Varden have on salmon, especially chum salmon populations that have been depressed in Norton Sound for several years, has been raised by local residents in a number of public meetings. The department has no data concerning the possible effects of Dolly Varden egg predation on salmon numbers, however there has been no detectable increase in Dolly Varden numbers in Norton Sound to account for increased predation activity, and Dolly Varden have not been found to be significant predators on chum salmon in published predation studies.

Ongoing Research and Management Activities

The ADF&G began an effort to assess Dolly Varden populations in waters of the Seward Peninsula in 1991. Abundances and size compositions have been estimated for Dolly Varden overwintering in the Nome River in 1991 and 1992, and in the Solomon River in 1991. In addition, the movement of marked fish from the Nome River in 1991 to other rivers in 1992 was estimated (DeCicco 1993). These data in combination with harvest estimates and observed changes in abundances have been used to guide ADF&G management activities. It has been learned that Dolly Varden that overwinter in a particular stream may overwinter in other streams during other years. Hence, a restrictive bag limit in one stream does not necessarily protect a single stock because fish range widely and stocks mix over a broad geographic area. Periodic assessment of Dolly Varden populations will continue as needed.

Studies in the Kotzebue area have continued intermittently since 1967, but in recent years have been limited to counting spawning Dolly Varden in Noatak River tributary streams with the

assistance of the National Park Service (NPS), and to counting Dolly Varden overwintering in the Wulik River with the assistance of the Habitat Division of ADF&G. Data on the abundance of Dolly Varden spawning in the Noatak River system and overwintering in the Wulik River will continue to be collected in cooperation with the NPS and the Habitat Division. A genetics study funded through the USFWS Office of Subsistence Management to determine the relationships among stocks north and south of the Bering Strait will soon be undertaken.

NORTHWESTERN ALASKA ARCTIC GRAYLING

Fishery Description and Historical Perspective

Arctic grayling are the most numerous species harvested in the Kotzebue/Chukchi Sea sub-area and the third or fourth most commonly harvested species in the Seward Peninsula/Norton Sound sub-area. In general, the sport fisheries for grayling in the northwestern area are small with average estimated annual harvests of 2,900 in the Seward Peninsula/Norton Sound sub-area and 2,200 in the Kotzebue/Chukchi Sea sub-area (Table 22). Average harvests have declined to about 1,200 fish and 1,100 fish, respectively, for these areas over the past five years.

The Seward Peninsula has long been known for its production of large Arctic grayling with approximately 25% of all trophy grayling registered with the department's trophy fish program coming from this area. However, most populations are quite small and since they are resident in separate, often small streams, they must be managed as independent units with regulations tailored to the individual populations or groups of similarly structured populations.

Since 1989, the stock status of grayling populations in several rivers where sport fishing occurs on the Seward Peninsula have been investigated (DeCicco 1990-1999). The Nome River stock was found to be overexploited, while the Niukluk, Fish, Pilgrim, Snake and Sinuk rivers populations are believed to be sustaining current levels of harvest. The Solomon River was found to have a very small Arctic grayling population.

Grayling densities in most Seward Peninsula rivers are low. They ranged from about 40 to 60 grayling per mile in the Nome and Sinuk rivers, to about 200 grayling per mile in the Pilgrim River. Densities in the Niukluk and Fish rivers were higher at about 375 grayling per mile in 1991. More recent data have shown density in the Niukluk River had increased to about 470 grayling per mile in 1998. In contrast, interior Alaskan populations often exceed 500 fish per mile. Average size of grayling from Seward Peninsula rivers is generally large and they are generally older and larger when they first spawn than grayling in interior Alaska streams. Since they can live for more than 20 years, some survive to grow very large, particularly in rivers where fishing effort is light. For example in the lightly exploited Sinuk River almost 70% of the 1991 sample was age-8 or older and the average total length of all fish sampled was almost 19 inches. However, the density of fish was low, approaching that of the Nome River which has been the most heavily fished stream in the area.

Populations of grayling in the Kotzebue area are inaccessible by road and are lightly exploited. Grayling occur in almost all streams of the area, and in many of the lakes as well. Most grayling in this area are captured in association with wilderness float trips or as an alternate species in trips directed toward Dolly Varden or sheefish. Over the past five years the estimated harvest rates have been about 13% of those captured (Table 22).

Prior to 1988, the daily bag limit for Arctic grayling in the NWMA was 15 with only 2 over 20 inches. In 1988, the BOF established a separate daily bag and possession limit for Arctic

Table 22.-Historic Arctic grayling harvests and catches in Seward Peninsula/Norton Sound waters, 1987-1998.

Areas	Year											
	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Estimated Arctic Grayling Harvests												
Salt Water	0	55	0	0	0	0	0	131	0	0	0	0
Nome River		891	2,032	33	186	0	0	16	0	0	0	0
Pilgrim River		109	516	415	445	91	75	49	52	56	81	0
Unalakleet R			142	99	1,708	98	131	353	291	376	128	119
Fish-Niukluk R.		1,237	748	415	1,320	128	585	506	404	187	734	16
Sinuk R.					129	0	37	8	18	68		8
Snake R.					402	16	467	32	18	94	0	8
Solomon R.					158	0	0	0	0			0
Other Streams	4,600	2,636	767	416	773	159	289	236	254	411	313	147
Lakes		0	0	0	0	0	0	0	0	0	0	0
Freshwater Total	4,600	4,873	4,205	1,378	5,121	492	1,584	1,200	1,037	1,192	1,256	298
Grand Total	4,600	4,928	4,205	1,378	5,121	492	1,584	1,331	1,037	1,192	1,256	298
Estimated Arctic Grayling Catches												
Salt Water												
Nome River				613	1,363	90	569	1,111	571	373	567	207
Pilgrim River				1,476	4,463	526	2,362	266	370	635	428	65
Unalakleet R				448	4,104	1,459	874	1,639	1,471	1,940	4,781	3,206
Fish-Niukluk R.				2,189	7,261	2,171	5,976	2,389	1,169	1,299	10,429	7,066
Sinuk R.				232	1,291	300	879	417	498	255	1,460	25
Snake R.				199	2,096	158	1,614	377	887	813	121	218
Solomon R.				33	602	38	140	212	200	74	701	0
Other Streams				929	1,980	1,030	809	670	622	953	1,630	1,621
Lakes				0	0	0	0	0	0	0	0	0
Freshwater Total				6,119	23,160	5,772	13,223	7,081	5,788	6,342	20,117	12,408
Grand Total				6,119	23,160	5,772	13,223	7,081	5,788	6,342	20,117	12,408

grayling in Northern Norton Sound of 5 per day, with only one over 15 inches. The effect of this change is reflected in harvest estimates which averaged about 4,300 grayling annually from 1980-1988, and about 1,400 from 1989-1997. Measurable changes in populations in the Fish and Niukluk rivers were likely due to this regulatory change. Both populations more than doubled in abundance when compared to abundance estimates from the early 1990's.

Recent Fishery Performance

Seward Peninsula/Norton Sound Sub-area

Estimated harvests of Arctic grayling by sport anglers in the Seward Peninsula/Norton Sound area have been declining since a high of 5,121 reached in 1991. Since then, harvests have averaged a little over 1,000 per year (Table 22). Estimated harvests have trended downward over the past five years of record, from about 1,600 in 1993 to about 1,256 in 1997 and 298 in 1998. The estimated catch of Arctic grayling tripled from 6,342 in 1996 to 20,117 in 1997, dropping in 1998 to 12,408 fish. It appears that catch and release practices are increasing in these grayling fisheries. The percentage of captured grayling that were harvested averaged about 17% from 1993 through 1996 and dropped to about 6% in 1997 and 2.4% during 1998.

Current exploitation rates on most northwestern Alaska grayling populations are unknown, but since most are in remote areas, exploitation is believed to be light. Some estimates of exploitation in Nome area roadside streams are available by combining harvest data with abundance data. Using these data for years with abundance estimates, exploitation rates of Arctic grayling have been estimated to range from 10 to 20% in some streams during the early 1990's. More recent estimates for the Niukluk and Fish rivers suggest that exploitation in these streams is near 1% or less. These data suggest a change in angler motivation toward enjoyment of a quality fishing experience, away from harvest as a primary reason for fishing.

Kotzebue Sub-area

In the Kotzebue/Chukchi Sea sub-area, harvests over the past five years have remained stable between 750 and 900 fish annually with the exception of 1996 when almost 2,000 Arctic grayling were harvested (Howe et al. 1997-1999). Catches over the same period have ranged quite widely from about 16,000 in 1995 to about 5,000 in 1997. The percentage of catch harvested has ranged from about 37% in 1992 to 6% in 1995. It has been about 16% during each of the past two years. Most grayling from this area are harvested in association with float trips or for variety, while fishing for other species. It is likely that harvests will remain stable until participation in this area increases significantly.

Fishery Objectives and Management

Arctic grayling spawn in the spring and the summer is spent feeding to recover condition in order to be able to spawn the next year. Arctic grayling in northwestern Alaska may live for more than 20 years and attain a large size. Research on the status of resident Arctic grayling populations in the rivers accessible by the road system in northern Norton Sound has been ongoing for about 10 years. Data on population abundance, age, and size composition by river throughout this period has allowed the development of regulations tailored to individual rivers or groups of rivers that share population characteristics. Overall management objectives for these Arctic grayling populations are to maintain the historic abundance, and size compositions, and to allow for population recovery in systems that have been stressed by over exploitation. Maintaining the opportunity to participate in high quality Arctic grayling fisheries is also an objective of management. The background daily bag and possession limits are 5 fish per day with only 1 over 15 inches. This bag limit is appropriate for drainages with Arctic grayling populations

that have characteristics of lightly exploited populations. These characteristics include large average size and a high proportion of sexually mature fish that are seven years of age or older in the population. Abundance is related more to the river's size and flow characteristics, therefore, both abundance and population density vary by river. Rivers that share these characteristics and regulations include the Fish/Niukluk River system, the Eldorado, Kuzitrin and Sinuk rivers. On the other extreme are over exploited populations where abundance is very low. Rivers like the Nome and Solomon are in this category. These rivers are closed to fishing for Arctic grayling. Populations intermediate between these two categories include those in the Pilgrim and Snake rivers. These populations contain a smaller proportion of sexually mature fish, have been impacted by harvest, but Arctic grayling are still relatively abundant. In these rivers the regulations allow harvest of 2 Arctic grayling per day with only 1 over 15 inches.

Management objectives have not been developed for remote Arctic grayling waters of the remainder of the Seward Peninsula or the Kotzebue sub-area. These waters are rarely visited by anglers and populations are in pristine condition. The general regulations for these waters provide for a liberal daily bag and possession limit of 10 fish with no size limits. Until effort and harvests increase, it is likely that regulations will remain unchanged.

Fishery Outlook

Northwestern Alaska, particularly Seward Peninsula waters provide some of the best opportunities in the state to capture large sized Arctic grayling. Some populations are dominated by mature fish with a large average size. Populations are managed to maintain this size structure by limiting the harvest of large fish. The result is a quality Arctic grayling fishing opportunity. The outlook for these fisheries to be maintained is favorable. Populations in the Fish and Niukluk rivers have recovered from relatively low levels of abundance in the early 1990's, and the outlook in these rivers is exceptional.

Recent Board of Fisheries and Management Actions

In 1992 the daily bag and possession limit for Arctic grayling in the Pilgrim River was reduced to 2 per day with only 1 over 15 inches, and the Nome and Solomon rivers were closed to fishing for Arctic grayling by emergency order. In 1993, the daily bag and possession limit in the Snake River was made the same as that in the Pilgrim River. In the 1994 meeting, the BOF adopted these bag limit changes for the Snake and Pilgrim rivers into regulation. After a population assessment in the Nome River in 1997 found that the population had not increased after five years of emergency closure, the BOF adopted regulations closing the Nome and Solomon rivers to fishing for Arctic grayling.

Current Issues

There is concern on the part of the public and ADF&G staff that populations of grayling in the vicinity of Nome that are road accessible, especially the Nome and Solomon rivers, have been over harvested and may not recover for many years. The Nome River population showed no increase over the past five years. An experimental restoration project in 1998 to increase survival of young-of-the-year Arctic grayling by rearing them in a gravel pit failed. Additional restoration efforts may be planned for this population using a different rearing pond. Other road accessible populations would be vulnerable to over exploitation if fishing practices and motivations were to change, however, at this time other populations appear to be healthy, and able to sustain the current low levels of harvest.

Ongoing Research and Management Activities

The ADF&G began an ongoing active effort to assess Arctic grayling populations in waters of the Seward Peninsula in 1989. Abundance and age and size compositions have been estimated for Arctic grayling in the Fish, Niukluk, Nome, Pilgrim, Snake and Sinuk rivers. These data in combination with harvest estimates and observed changes in abundance or size or age compositions have been used to guide ADF&G management activities. Special regulations in some streams and the closure of both the Solomon and Nome rivers to grayling have resulted. A assessment of the Nome River grayling population in 1997 found that it has not recovered even with five years of closure to sport fishing. Periodic assessment of grayling populations will be continued on a rotating basis so changes in stock status can be tracked and chances of a stock being overexploited can be minimized.

KOTZEBUE SOUND SHEEFISH

Fishery Description and Historical Perspective

Within the NWMA, except for a small population of sheefish that reside in the Koyuk River of Norton Bay, spawning stocks of sheefish occur only in the Kobuk and Selawik rivers (Alt 1975).

The drainages of Kotzebue Sound are known for the large size of sheefish which are available to the sport angler. These are high quality sport fisheries in remote locations, and are considered by many to be some of the "crown jewels" of Alaskan fishing. Since the inception of ADF&G's Trophy Fish Program in 1967, all but one of the qualifying sheefish have come from the Kobuk River.

Kotzebue Sound sheefish are distributed throughout the nearshore estuarine areas of Kotzebue Sound. The major concentration is in Hotham Inlet but a few fish occur in the Sheshalik and Krusenstern areas as well as in southern Kotzebue Sound, especially in summer (Figure 13). Nearly all sheefish occupying the estuarine environment during summer are immature or nonspawning adults, while adult prespawning fish move upstream on the Kobuk and Selawik rivers to spawn just before freeze-up in the fall. The Kobuk River stock with 32,000 to 43,000 spawning in 1995-1996 (Taube 1997, 1998) is the largest and most heavily utilized. They spawn upstream from the village of Kobuk, with the greatest observed concentrations between the Maneluk River and Beaver River. After spawning is complete in late September, fish disperse to downstream overwintering areas. Abundance of sheefish spawning in the Selawik River was estimated at about 5,200 fish during 1995 and 1996 (Underwood et al. 1998). Tag recoveries showed that these stocks mixed in Hotham Inlet winter habitats, but maintained fidelity to their spawning areas.

Sport fisheries for sheefish are managed by the Division of Sport Fish of ADF&G. Subsistence fisheries are given priority. The commercial fishery and much of the subsistence harvest takes place through the ice while sport fisheries are mainly summer and fall activities. The same population(s) contribute to all harvests. The annual commercial sales of sheefish in Kotzebue have ranged from 200 to 850 fish since 1991 (Brennan et al. 1998, 1999). The magnitude of the subsistence harvest in the villages of the Kobuk River was estimated at about 7,000 in 1996 (Georgette and Utermohle 1997), 9,800 in 1997, and 5,350 in 1998 (Brennan et al. 1999). Since subsistence practices have not changed appreciably in recent years, it is likely that Kobuk River subsistence harvests have been relatively stable at, or near, these levels, and will remain so. Winter gill net harvests from the fishery near Kotzebue were estimated at about 15,000 in 1995-

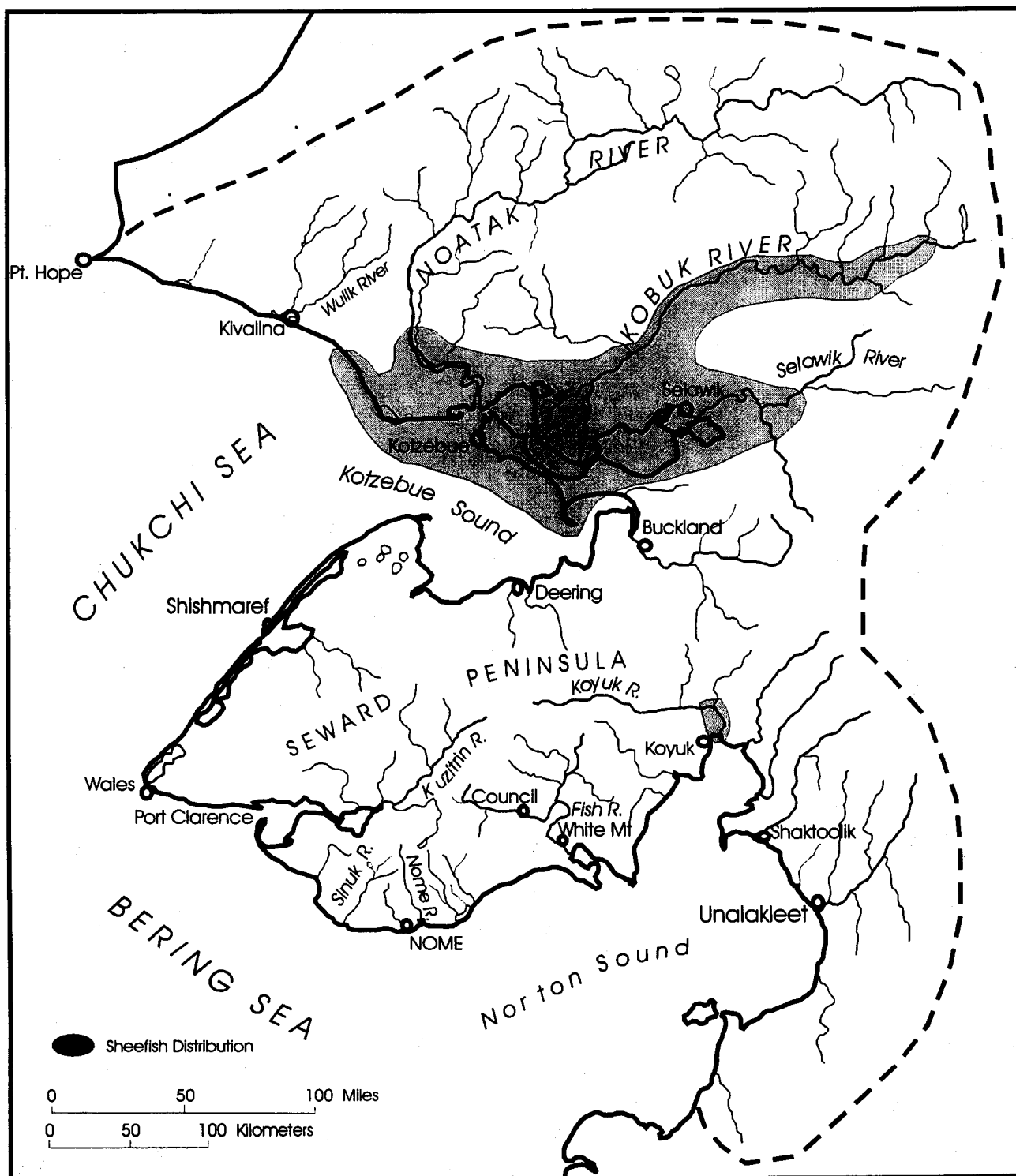


Figure 13.-Sheefish distribution in the NWMA.

1996, and about 14,000 in 1996-1997 (Taube 1997, 1998). Sheefish are also taken by jigging lures under the ice in Hotham Inlet and Selawik Lake, but harvests are undocumented.

The Sport Fish Division of ADF&G conducted studies of the ecology, movements, and growth of sheefish between 1966 and 1979. Much of this work was conducted in northwestern Alaska and was summarized by Alt (1987). After some familiarization work in 1994, ADF&G Division of Sport Fish in cooperation with the National Park Service (NPS), began a project to estimate abundance of sheefish spawning in the Kobuk River. This project continued through 1997 and established base line estimates on spawner abundance, age, size and sex composition of the spawning population. Estimates of spawner abundance for the three years of study were 32,000, 43,000 and 32,500 respectively. Tag recovery data indicated that, although some sheefish were capable of spawning in consecutive years, most spawned every other year. The abundance of sheefish spawning in the Selawik River was estimated at 5,200 and 5,150 in 1995 and 1996 by the U. S. Fish and Wildlife Service (Underwood et al. 1998).

Most sheefish sport fishing effort occurs on the Kobuk River spawning population. Most of the area-wide subsistence harvest and the entire commercial harvest of sheefish occur on the entire (spawners and nonspawners) population. When taken in isolation, recent sport harvests of about 800 fish annually are easily sustainable. Although spawner abundances have recently been estimated, the total size of the area wide population is not known, and the sport harvest must be viewed in relation to other ongoing harvests. It was always assumed that subsistence harvests are much greater than either commercial or sport harvests, and recent data support this assumption. In order to ensure sustained yields from these population(s), a management approach involving the subsistence and commercial fisheries for sheefish is recommended. Sheefish are very fecund fish with some large females containing over 400,000 eggs. Such populations may be subject to episodic recruitment events depending on environmental conditions. If spawner abundances are maintained above some threshold level, intermittent years of good recruitment should carry the population through years when environmental conditions are less favorable.

Recent Fishery Performance

Estimated harvests of sheefish by sport anglers in northwestern Alaska have fluctuated from a high of about 1,900 in 1992 to a low of about 145 in 1998 with an average annual harvest of about 950 fish over the past 21 years (Table 23). The most recent five year average harvest has been about 700 sheefish. In addition to harvests, catches have been estimated through the SWHS since 1990. Estimates of sheefish catch (which includes fish that are kept and those released) for the past five years was about 1,500 fish, indicating that about 60% of all sheefish captured in northwestern Alaska by sport anglers are released. In a 1997 hook and release study, the mortality of sheefish caught and released on sport fishing gear was found to be low, 3.3% for treble hook lures, and 1.7% for single hook lures (Stuby and Taube 1998). Overall mortality was 2.4%. Approximately 65% of all sheefish caught on the Kobuk River over the past nine years have been released. The Kobuk River is probably the most popular sheefish destination in North America, and people from the world over come there to fish for this unique species but the level of fishing effort is still quite low. Approximately 540 anglers fished for a total of 2,050 angler-days on the Kobuk River during 1998. This was about half the overall freshwater sport fishing effort in the Kotzebue sub-area (3,640 angler-days).

Table 23.-Historic sheefish harvests and catches from northwest Alaska waters, 1977-1998.

Year	Sheefish		% Harvested	Kobuk River		Selawik River	
	Harvest	Catch		Harvest	Catch	Harvest	Catch
1977	656						
1978	506						
1979	709						
1980	1,713						
1981	1,263			1,015			
1982	2,222			1,886			
1983	2,079			1,448			
1984	3,050						
1985	1,645			1,330			
1986	3,363			1,590			
1987	1,836			865			
1988	964			964			
1989	629			131			
1990	151	403	37	151	336	0	0
1991	603	1,616	37	579	1,568	24	48
1992	1,904	3,678	52	627	2,034	411	411
1993	1,029	2,273	45	395	1,074	111	111
1994	564	958	59	135	386	95	95
1995	1,142	3,270	35	748	2,669	38	47
1996	362	1,458	25	245	1,146	88	254
1997	902	2,333	39	687	1,523	108	108
1998	414	924	45	145	617	148	186
1988-97 Avg	825	1,999	41	466	1,342	109	134
1993-97 Avg	800	2,058	41	442	1,360	88	123

Fishery Objectives and Management

The Kobuk River sheefish fishery is managed to maintain opportunity to participate in this unique high-quality sport fishery while keeping harvests from spawning areas low. In order to accommodate local use of this resource downstream from major spawning areas, the daily bag limit is generous downstream from the Mauneluk River (10 sheefish per day). In the spawning area upstream from the Mauneluk River, only two fish per day are allowed to be harvested or in possession. The majority of anglers visiting the Kobuk River for sheefish use the area upstream from the Mauneluk River.

Fishery Outlook

The outlook for sheefish fisheries in northwestern Alaska are good in the immediate future. Although overall harvest levels are substantial, populations appear to be healthy, spawner abundances are high and sport harvests are low.

Recent Board of Fisheries and Management Actions

During 1988, the Board of Fisheries adopted the current regulations for sheefish in the waters of northwestern Alaska: 10 fish per day and 10 in possession, with an exception for the Kobuk River upstream of the Mauneluk River where only 2 sheefish may be caught per day or possessed. The ADF&G believes that these regulations are sufficient to allow ample opportunity for sport fishing, yet keeping harvests low. The 10 fish limit in the lower Kobuk River and the remainder of the management area is liberal enough to allow local fishermen who choose to catch sheefish on sport fishing tackle the opportunity to take sheefish without the need to fish with nets. There have been no recent BOF or management actions regarding sheefish in the NWMA. There is some concern that the daily bag limit of 10 fish on the smaller Selawik River is too liberal. Fishing effort, although low, appears to be increasing on this river, and it is likely that a proposal that would mirror the regulations for the Kobuk River will be put forward in the near future.

Current Issues

Local native residents of Kobuk River villages have expressed concern over some practices of sport anglers on the upper Kobuk River in the vicinity of the sheefish spawning grounds. Catch and release fishing is considered by some local residents to be disrespectful and damaging to the fish, and the discarding of filleted carcasses in the water is thought to drive other sheefish away from the area. The ADF&G Division of Subsistence investigated local concerns in the upper Kobuk River in 1986 and determined that some concerns could be addressed if sport fishers were more aware of local customs and culture. Catch and release fishing is viewed as a conservation tool by ADF&G and by many anglers and although sheefish are very sensitive to rough handling, the department believes that if handled gently, they can be released without significant mortality. The recent mortality study supports this position and, an educational brochure explaining proper hook and release techniques for sheefish has been developed in association with the NPS. This brochure will be made available to those fishing on the upper Kobuk River. It is hoped that with proper handling, impacts of catch and release fishing to the spawning population can be minimized.

Because the subsistence component of the harvest is high, and some sheefish spawning areas are located within federally managed lands, the possibility exists that federal subsistence management in these areas may affect sport fishing opportunity there. This issue may be

addressed in the future as the USFWS Office of Subsistence Management becomes more involved with active management of fisheries in remote areas of Alaska.

Ongoing Research and Management Activities

The department believes that recent research conducted cooperatively with the USFWS and the NPS has provided substantial background data on spawner abundance for the two stocks comprising the Kobuk-Selawik sheefish population. These data will be used as a base line to which future population assessments can be compared. Additional studies to monitor harvests may be planned. Current low levels of sport fishing harvest are unlikely to be affecting the sustained yields of this species in northwestern Alaska.

NORTHWESTERN ALASKA NORTHERN PIKE

Fishery Description and Historical Perspective

Northern pike are present throughout the northern regions of the world. They are primarily a freshwater resident species, but are known to enter weakly brackish waters in the Baltic and in some other areas. The known distribution of northern pike in northwestern Alaska is shown in Figure 14.

Northern pike occur in most of the lakes and flowing waters of the Noatak and Kobuk rivers and are particularly common in wetlands of the lower reaches, delta areas, and in lakes in lowland areas adjacent to these rivers. Northern pike are also common residents of the waters along the western shores of Hotham Inlet, Selawik Lake and the entire Selawik lowland area. They occur in the lower portions of the Buckland River drainage, and may also be present in some lakes and streams on the northern Seward Peninsula. On the remainder of the Seward Peninsula, northern pike are common residents of Imuruk Basin and the middle and lower reaches of the Pilgrim and Kuzitrin rivers. These two adjacent drainages form a large interconnected wetland area (approximately 380 km²) in their lower reaches. In addition there is another large wetland area (approximately 650 km²) farther upstream in the Kuzitrin River drainage. Northern pike are also found in the Fish River drainage and have even been observed in the fast clear waters of the Niukluk River downstream from Council. They occur in the Koyuk River and may be present in the Kwik River near Moses Point, but are not known to be present in other Norton Sound drainages south of the Koyuk River.

The majority of northern pike harvested in northwestern Alaska are taken for subsistence. Few community harvest estimates are available, however, in 1986, 5,750 northern pike were estimated to have been harvested by the community of Kotzebue. During the mid 1980's a commercial freshwater fishery occurred near Selawik. In 1985, the USFWS estimated that the spring subsistence/commercial harvest (only some of the fish were sold) of northern pike was between 5,671 and 9,138 fish. Currently, without the commercial fishery, the annual harvest at Selawik is still likely several thousand northern pike. Northern pike are also harvested by residents of the lower Kobuk River villages of Noorvik and Kiana, and the residents of Teller who fish in Imuruk Basin drainages. Additional harvests of northern pike may take place near other area villages. The total annual northwestern Alaska northern pike subsistence harvest is likely 15,000 fish or more.

Sport fisheries for northern pike occur around Kotzebue in lakes in the lower Noatak and Kobuk river drainages, but participation and harvests are low. About 650 northern pike were estimated to have been harvested in the Kotzebue sub-area of NWMA during 1997, and 900 in 1998

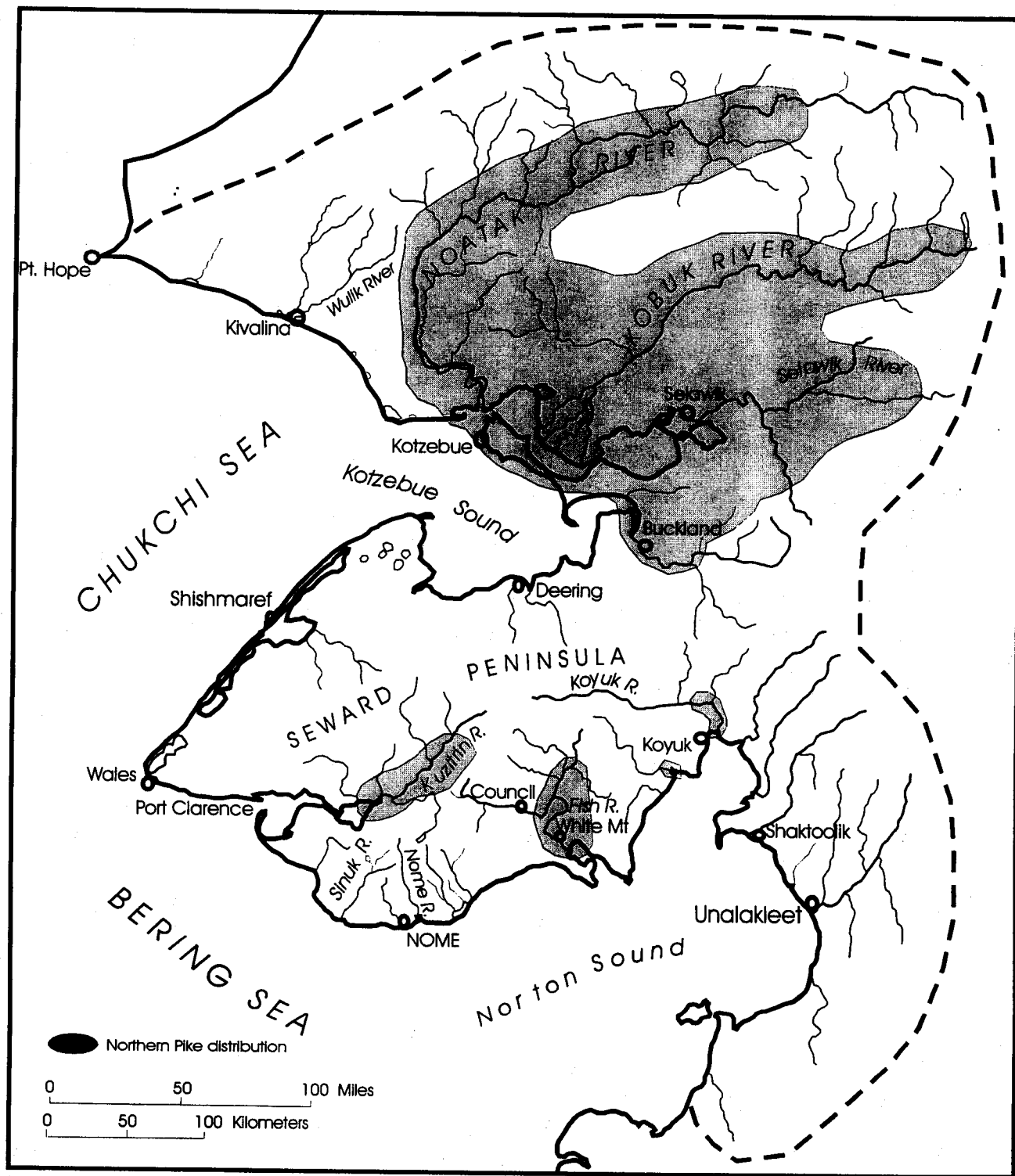


Figure 14.-Northern pike distribution in the NWMA.

(Table 24). In the Seward Peninsula/Norton Sound sub-area, virtually the entire harvest of northern pike comes from Imuruk Basin drainages, and most of that from the Kuzitrin or lower Pilgrim rivers. During 1997, 362 northern pike were estimated to have been harvested, and during 1998, the harvest was estimated at 75 northern pike in this fishery.

Recent Fishery Performance

Estimated harvests of northern pike by sport anglers on the Seward Peninsula have averaged about 550 fish since 1977, with the largest annual harvest estimated at nearly 2,000 in 1990 (Table 24). The average annual harvest for the past five years was 380 fish, and the 1998 estimated harvest was 75 fish. Estimates of catch (which includes fish that are kept and those released) since 1990 indicate that about 70% of all pike caught in the past eight years have been released. It is assumed that anglers are selectively retaining larger sized northern pike. Most of the harvest of pike on the Seward Peninsula takes place in the Pilgrim or Kuzitrin River drainages. During 1992 and 1993 the abundance of northern pike in the lower Pilgrim and Kuzitrin rivers was estimated at about 10,000 fish over 300 mm (12 in) in length for the portion of the population inhabiting these rivers from the road crossings downstream to their confluence (Burkholder 1993, 1994). Northern pike populations have been shown to sustain annual harvests of about 15%. Current exploitation of the Pilgrim-Kuzitrin population appears to be less than 5%, which is well within what are thought to be sustainable levels.

Estimated sport harvests of northern pike in the Noatak-Kobuk-Selawik area of northwestern Alaska have averaged about 590 fish since 1977 (Table 24). Estimated harvests reached a high of 2,752 fish in 1986, and a low of 64 fish in 1989. The harvest in 1998 was about 200 fish. The average annual harvest for the past five years has been about 270 fish. Since assessment of northern pike populations has not been carried out in this area of northwestern Alaska, the health of populations and relative influence of harvests can only be inferred by comparing the area to other parts of Alaska. The amount of suitable northern pike habitat in the Noatak-Kobuk-Selawik area is much greater (by approximately 50 times) than that available to northern pike in the Pilgrim-Kuzitrin area, and the sport harvests are much lower. It is unlikely that sport fisheries are adversely impacting northern pike populations, even when taken in addition to a subsistence harvest of 6,000 to 10,000 fish.

Fishery Management Objectives

There are no specific management objectives of northern pike fisheries in NWMA. Regulations are liberal and management is structured to encourage participation. Liberal regulations provide the opportunity for rural residents to harvest northern pike with rod and reel within the sport fishing regulatory framework. Base line data exists for the Pilgrim/Kuzitrin portion of the Imuruk Basin population complex. Because of the proximity of Nome, it is likely that this population will be the first in the NWMA to require more restrictive regulations as the human population in the Nome area grows. Harvests are monitored through the SWHS. If large changes in harvest occur, additional stock assessment work will be conducted.

Fishery Outlook

Changes in fishery regulations for northern pike in NWMA are not expected in the near future. Pike populations are largely unexploited, and both participation and harvest are low.

Recent Board of Fisheries and Management Actions

There have been no recent BOF or management actions concerning northern pike. The current daily bag and possession limit in the NWMA is 10 fish with no size limit.

Table 24.-Historic northern pike harvests and catches in NWMA by sub-area 1977-1998.

Year	Seward Peninsula/Norton Sound Sub-area					Kotzebue/Chukchi Sea Sub-area				
	Number of Anglers	Effort Angler Days	Northern Pike Harvest	Northern Pike Catch	% Harvest	Number of Anglers	Effort Angler Days	Northern Pike Harvest	Northern Pike Catch	% Harvest
1977		7,828	302				3,487	147		
1978		8,379	389				4,997	389		
1979		8,725					2,593	527		
1980		7,958	284				3,841	852		
1981		10,879	303				5,284	465		
1982		13,198	210				6,906	454		
1983		16,944	798				7,963	1,262		
1984	1,597	17,436	208			696	7,791	312		
1985	2,854	19,919	56			1,788	6,701	383		
1986	2,872	18,107	699			1,570	6,313	2,752		
1987	2,528	20,413	906			2,090	9,288	813		
1988	2,661	20,278	564			959	5,279	1,565		
1989	2,560	17,692	648			1,028	4,932	64		
1990	2,686	21,799	1,957	4,145	47	991	3,782	320	1,730	18
1991	3,236	23,622	1,429	4,257	34	1,606	9,543	394	1,879	21
1992	3,540	22,684	479	3,742	13	1,421	6,145	333	1,666	20
1993	3,134	18,930	537	2,117	25	1,575	7,809	559	2,209	25
1994	3,016	18,922	376	1,731	22	1,100	6,036	287	1,488	19
1995	3,719	19,647	215	1,856	12	1,957	8,495	256	1,421	18
1996	3,208	18,637	410	1,747	23	1,501	7,763	82	816	10
1997	2,786	13,934	362	2,176	17	827	3,752	145	656	22
1998	3,206	13,616	75	452	17	1,089	3,801	195	1,104	18
Avg 1988-97	1,993	19,615	698	2,721	24	1,297	6,354	401	1,483	19
Avg 1993-97	3,173	18,014	380	1,925	20	1,392	6,771	266	1,318	19

Current Issues

There are no current issues regarding northern pike in the NWMA. Harvest level will continue to be monitored through the SWHS. If harvests increase dramatically, additional research may be undertaken.

Ongoing Research Activities

There are no current research activities associated with northern pike in the NWMA.

ACKNOWLEDGMENTS

I thank Sara Case, Region III publications technician for assistance in final report preparation.

LITERATURE CITED

- Alaska Department of Fish and Game (ADF&G). 1984. Sport Fish Survey. Booklet published by Alaska Department of Fish and Game, Division of Sport Fisheries. Juneau, Alaska.
- Alaska Department of Fish and Game (ADF&G). 1986. Alaska Habitat Management Guide, Arctic Region. Vol. II: Distribution, abundance, and human use of fish and wildlife. Division of Habitat, Alaska Department of Fish and Game, Juneau.
- Alaska Department of Labor (ADL). 1991. Alaska Population Overview 1990 Census and Estimates. Demographic Unit, Research and Analysis. Juneau, Alaska. 144 pp.
- Alt, K. T. 1975. A life history study of sheefish and whitefish in Alaska. Alaska Department of Fish and Game. Federal Aid in Fish Restoration. Annual Performance Report. 1974-1975, Project F-9-7, 16(R-II): 19 pp.
- Alt, K. T. 1977. Inventory and cataloging of sport fish and sport fish waters of western Alaska. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Project F-9-9, Completion Report, 1975-1977.
- Alt, K. T. 1978. Inventory and cataloging of sport fish and sport fish waters of western Alaska. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Volume 19, Study G-I-P, Annual Performance Report 1977-1978.
- Alt, K. T. 1984. Inventory and cataloging of sport fish and sport fish waters of western Alaska. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, F-9-16, Volume 25, Study G-I, Annual Performance Report 1983-1984.
- Alt, K. T. 1987. Review of sheefish (*Stenodus leucichthys*) studies in Alaska. Alaska Department of Fish and Game, Fishery Manuscript No. 2, Juneau.
- Brennan, E. L., F. J. Bue, C. F. Lean and T. L. Lingnau. 1998. Annual Management Report 1997, Norton Sound-Port Clarence-Kotzebue. Regional Information Report No. 3A98-28. Alaska Department of Fish and Game, Division of Commercial Fisheries Management and Development, Anchorage, Alaska.
- Brennan, E. L., C. F. Lean, F. J. Bue and T. Kohler. 1999. Annual Management Report 1998, Norton Sound-Port Clarence-Kotzebue. Regional Information Report No. 3A99-32. Alaska Department of Fish and Game, Division of Commercial Fisheries Management and Development, Anchorage, Alaska.
- Burch, E. S., Jr. 1985. Subsistence production in Kivalina, Alaska: a twenty-year perspective. Technical Paper No 128. Alaska Department of Fish and Game, Division of Subsistence, Juneau, Alaska.
- Burkholder, A. 1993. Abundance and length-at-age composition of northern pike near the confluence of the Pilgrim and Kuzitrin rivers, 1992. Alaska Department of Fish and Game, Fishery Data Series No. 93-16, Anchorage.
- Burkholder, A. 1994. Abundance and length composition of northern pike near the confluence of the Pilgrim and Kuzitrin rivers, 1992-1993. Alaska Department of Fish and Game, Fishery Data Series No. 94-20, Anchorage.

LITERATURE CITED (Continued)

- DeCicco, A. L. 1990. Seward Peninsula Arctic grayling study 1989. Alaska Department of Fish and Game, Fishery Data Series No. 90-11, Anchorage.
- DeCicco, A. L. 1991. Seward Peninsula Arctic grayling study 1990. Alaska Department of Fish and Game, Fishery Data Series No. 91-24, Anchorage.
- DeCicco, A. L. 1992. Assessment of selected stocks of Arctic grayling in streams of the Seward Peninsula, Alaska during 1991, Alaska Department of Fish and Game, Fishery Data Series No. 92-13, Anchorage.
- DeCicco, A. L. 1992. Assessment of Dolly Varden overwintering in selected streams of the Seward Peninsula, Alaska, during 1991. Alaska Department of Fish and Game, Fishery Data Series No. 92-11, Anchorage.
- DeCicco, A. L. 1993. Assessment of selected stocks of Arctic grayling in streams of the Seward Peninsula, Alaska during 1992,. Alaska Department of Fish and Game, Fishery Data Series No. 93-36, Anchorage.
- DeCicco, A. L. 1993. Assessment of Dolly Varden overwintering in selected streams of the Seward Peninsula, Alaska, during 1992. Alaska Department of Fish and Game, Fishery Data Series No. 93-20, Anchorage.
- DeCicco, A. L. 1994. Assessment of selected stocks of Arctic grayling in streams of the Seward Peninsula, Alaska during 1993. Alaska Department of Fish and Game, Fishery Data Series No. 94-12, Anchorage.
- DeCicco, A. L. 1995. Assessment of selected stocks of Arctic grayling in streams and a survey of Salmon Lake, Seward Peninsula, 1994. Alaska Department of Fish and Game, Fishery Data Series No. 95-19, Anchorage.
- DeCicco, A. L. 1996. Assessment of selected stocks of Arctic grayling in streams of the Seward Peninsula, 1995. Alaska Department of Fish and Game, Fishery Data Series No. 96-21, Anchorage.
- DeCicco, A. L. 1997. Assessment of selected stocks of Arctic grayling in streams of the Seward Peninsula, 1996. Alaska Department of Fish and Game, Fishery Data Series No. 97-15, Anchorage.
- DeCicco, A. L. 1998. Assessment of selected stocks of Arctic grayling in streams of the Seward Peninsula, 1997. Alaska Department of Fish and Game, Fishery Data Series No. 98-19, Anchorage.
- DeCicco, A. L. 1999. Niukluk River Arctic grayling stock assessment, Seward Peninsula, 1998. Alaska Department of Fish and Game, Fishery Data Series No. 99-23, Anchorage.
- DeCicco, A. L. and R. M. Barnes. 1992. Listing of guiding services for recreational fishing in the Arctic-Yukon-Kuskokwim (AYK) Region. Alaska Department of Fish and Game, Special Publication No. 92-3, Anchorage.
- Foote, D. C. and H. A. Williamson. 1966. A human geographical study. Pages 1041-1111 *in* Environment of the Cape Thompson region, Alaska. N. Wilimovsky and J. Wolfe, eds. U. S. Atomic Energy Commission.
- Georgette, S. and C. Utermohle. 1998. Subsistence salmon harvest summary, northwest Alaska 1997. Alaska Department of Fish and Game, Division of Subsistence, Nome.
- Kretsinger, C. 1987. Fishery inventory of lakes and streams in the Kigluaik mountains and Imuruk Basin watershed (Seward Peninsula). Unpublished paper, U.S. Bureau of Land Management. Kobuk District Office, Fairbanks.
- Howe, A.H., G. Fidler and M. H. J. Mills. 1995. Harvest, catch and participation in Alaska sport fisheries during 1994. Alaska Department of Fish and Game, Fishery Data Series No. 95-24, Anchorage.
- Howe, A.H., G. Fidler, A. E. Bingham and M. H. J. Mills. 1996. Harvest, catch and participation in Alaska sport fisheries during 1995. Alaska Department of Fish and Game, Fishery Data Series No. 96-32, Anchorage.
- Howe, A.H., G. Fidler, C. Olness, A. E. Bingham and M. H. J. Mills. 1997. Harvest, catch and participation in Alaska sport fisheries during 1996. Alaska Department of Fish and Game, Fishery Data Series No. 97-29, Anchorage.
- Howe, A.H., G. Fidler, C. Olness, A. E. Bingham and M. H. J. Mills. 1998. Harvest, catch and participation in Alaska sport fisheries during 1997. Alaska Department of Fish and Game, Fishery Data Series No. 98-25, Anchorage.

LITERATURE CITED (Continued)

- Howe, A.H., R. J. Walker, C. Olnes, G. Heineman and A. E. Bingham. 1999. Harvest, and catch in Alaska sport fisheries during 1998. Alaska Department of Fish and Game, Fishery Data Series No. 98-41, Anchorage.
- Mills, M. J. 1979. Alaska statewide sport fish harvest studies. 1977 data. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Progress, 1977-1978. Project F-9-11, 20 (SW-1): 112 pp.
- Mills, M. J. 1980. Alaska statewide sport fish harvest studies. 1978 data. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Progress, 1979-1980. Project F-9-12, 21 (SW-1): 65 pp.
- Mills, M. J. 1981. Alaska statewide sport fish harvest studies. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Progress, 1980-1981. Project F-9-13, 22 (SW-1): 78 pp.
- Mills, M. J. 1982. Alaska statewide sport fish harvest studies. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Progress, 1981-1982. Project F-9-13, 23 (SW-1): 115 pp.
- Mills, M. J. 1983. Alaska statewide sport fish harvest studies. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Progress, 1982-1983. Project F-9-14, 24 (SW-1): 118 pp.
- Mills, M. J. 1984. Alaska statewide sport fish harvest studies. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Progress, 1983-1984. Project F-9-16, 25 (SW-1): 122 pp.
- Mills, M. J. 1985. Alaska statewide sport fish harvest studies. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Progress, 1984-1985. Project F-9-17, 26 (SW-1): 88 pp.
- Mills, M. J. 1986. Alaska statewide sport fish harvest studies. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Progress, 1985-1986. Project F-9-18, 27 (SW-1): 137 pp.
- Mills, M. J. 1987. Alaska statewide sport fish harvest studies. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Report of Progress, 1986-1987. Project F-9-19, 28 (SW-1): 91 pp.
- Mills, M. J. 1988. Alaska statewide sport fisheries harvest report 1987. Alaska Department of Fish and Game, Fishery Data Series No. 52, Juneau.
- Mills, M. J. 1989. Alaska statewide sport fisheries harvest report 1988. Alaska Department of Fish and Game, Fishery Data Series No. 122, Juneau.
- Mills, M. J. 1990. Harvest and participation in Alaska sport fisheries during 1989. Alaska Department of Fish and Game, Fishery Data Series No. 90-44, Anchorage.
- Mills, M. J. 1991. Harvest, catch and participation in Alaska sport fisheries during 1990. Alaska Department of Fish and Game, Fishery Data Series No. 91-58, Anchorage.
- Mills, M. J. 1992. Harvest, catch, and participation in Alaska sport fisheries during 1991. Alaska Department of Fish and Game, Fishery Data Series Number 92-40, Anchorage.
- Mills, M. J. 1993. Harvest, catch, and participation in Alaska sport fisheries during 1992. Alaska Department of Fish and Game, Fishery Data Series Number 93-42, Anchorage.
- Mills, M. J. 1994. Harvest, catch, and participation in Alaska sport fisheries during 1993. Alaska Department of Fish and Game, Fishery Data Series Number 94-28, Anchorage.
- National Park Service (NPS). 1984. Kobuk Valley National Park draft statement for management. USDI: NPS, Alaska Regional Office, Anchorage, Alaska.
- National Park Service (NPS). 1985. Gates of the Arctic National Park General Management Plan. USDI: NPS,
- Phillips, R. B., L. I. Gaudex, K. M. Westrich and A. L. DeCicco. 1999. Combined phylogenetic analysis of ribosomal ITS1 sequences and new chromosome data supports three subgroups of Dolly Varden char (*Salvelinus malma*). Canadian Journal of Fisheries and Aquatic Sciences 56:1504-1511.
- Sarrio, R. and B. Kessel. 1966. Human ecological investigations at Kivalina. Pages 969-1040 in Environment of the Cape Thompson region, Alaska. N. Wilimovsky and J. Wolfe, eds. U. S. Atomic Energy Commission.

LITERATURE CITED (Continued)

- Stuby, L. and T. Taube. 1998. Mortality of sheefish captured and released on sport fishing gear in the Kobuk River, 1997. Alaska Department of Fish and Game, Fishery Data Series No. 98-15. Anchorage.
- Taube, T. T. 1997. Abundance and composition of sheefish in the Kobuk River, 1996. Alaska Department of Fish and Game, Fishery Data Series No. 97-1, Anchorage.
- Taube, T. T. and K. Wuttig. 1998. Abundance and composition of sheefish in the Kobuk River, 1997. Alaska Department of Fish and Game, Fishery Manuscript No. 98-3, Anchorage.
- Underwood, T., K. Whitten, and K. Secor. 1998. Population characteristics of spawning Inconnu (sheefish) in the Selawik River, Alaska, 1993-1996, Final Report. Alaska Fisheries Technical Report Number 49, U.S. Fish and Wildlife Service, Fairbanks Fishery Resource Office, Fairbanks, Alaska.
- U.S. Army Corps of Engineers, Alaska District. 1967. Harbors and Rivers in Alaska. Interim Report No. 6. Northwestern Alaska.
- Wild and Scenic Rivers Act. 1968. U.S. Public Law 90-542. Amended December, 1980 with Public Law 96-603-605.
- Wuttig, K. G. 1998. Escapement of chinook salmon in the Unalalkeet River in 1997. Alaska Department of Fish and Game, Fishery Data Series No. 98-8, Anchorage.

APPENDIX A

Appendix A.–National Wild and Scenic Rivers in the NWMA.

Streams Within The National Park System

Kobuk River. The portion within the Gates of the Arctic National Park and Preserve.

Noatak River. The river from its source in the Gates of the Arctic National Park to its confluence with the Kelly River in the Noatak National Preserve.

Salmon River. The portion with the Kobuk Valley National Park.

Streams Within The National Wildlife Refuge System

Selawik River. The portion from a fork of the headwaters in township 12N, Range 10E, Kateel River meridian to the confluence of the Kugarak River; within the Selawik National Wildlife Refuge .

Streams Located Outside National Parks and Refuges

Unalakleet River. The segment of the main stem from the headwaters in township 12S, Range 3W, Kateel River meridian extending downstream approximately 65 miles to the western boundary of township 18S, range 8W.

APPENDIX B

Appendix B. –Northwestern Area sport fishing regulations summary for 1997.

NORTHWESTERN ALASKA**SEASONS**

Entire year for all species except halibut. Halibut season is February 1-December 31.

BAG, POSSESSION, AND SIZE LIMITS GENERAL REGULATIONS

The general regulations for all waters of the Northwestern Area are listed below..Special regulations for individual water bodies appear afterward (at bottom of page).

Species	Daily Bag	Possession & Size Limit
King salmon	1	(no size limit)
Other salmon	10	(no size limit)
Arctic char/Dolly Varden (all lakes)	2	(no size limit)
Flowing and salt water	10	(only 2 over 20 inches)
Lake trout	4	(no size limit)
Arctic grayling	10	(no size limit)
Sheefish	10	(no size limit)
Northern pike	10	(no size limit)
Burbot	15	(no size limit)
Halibut	2 per day	4 in possession, no size limit
Outlet stream (Pilgrim River) 300 feet downstream from - Other fish		No limit
Shellfish	See page XX	

-continued-

SPECIAL REGULATIONS

KOBUK RIVER DRAINAGE (upstream of the mouth of the Mauneluk River):

1. Sheefish- daily bag and possession limit is 2 fish, no size limit

NORTHERN NORTON SOUND (all waters draining into Norton Sound from Cape Darby to Cape Prince of Wales (see map):

- | | |
|--|---|
| 1. Chum salmon: | Daily bag and possession limit is 3 fish, not size limit

<i>**All freshwater drainages and marine waters between the west bank of the Sinuk River and Topkok Head (see map) are closed to chum salmon fishing.**</i> |
| 2. Coho salmon: | Daily bag and possession limit is 3 fish, no size limit |
| 3. Sockeye salmon: | Daily bag and possession limit is 3 fish, not size limit |
| 4. Pink salmon: | Daily bag and possession limit is 10 fish, no size limit |
| 5. Arctic grayling: | Daily bag and possession limit is 5 fish, only 1 over 15 inches |
| 6. Salmon Lake, its tributaries, and the lake outlet are: | <i>Closed to salmon fishing.</i> |
| 7. Nome River: | <i>Closed to fishing for Arctic grayling</i> |
| 8. Pilgrim River drainage: | Arctic grayling daily bag and possession limit is 2 fish, only 1 over 15 inches. |
| 9. Snake Rive drainage: | Arctic grayling daily bag and possession limit is 2 fish, only 1 over 15 inches. |
| 10. Solomon River: | <i>Closed to fishing for Arctic grayling</i> |

UNALAKLEET RIVER DRAINAGE:

- | | |
|---------------------|--|
| 1: Arctic grayling: | Daily bag and possession limit is 5 fish, only 1 over 15 inches |
|---------------------|--|